FINAL ENVIRONMENTAL IMPACT REPORT

DAVIS FAMILY ESTATES
FRIESEN VINEYARD PROJECT

MARCH 2016

LEAD AGENCY:

California Department of
Forestry and Fire Protection
P.O. Box 944246
Sacramento, CA 94244-2460

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P.O. Box 944246
Sacramento, CA 94244-2460

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** Appendices printed in gray text (Appendices A – O) are attached to the Draft EIR dated August 2015 and are available online at: http://calfire.ca.gov/resource_mgt/downloads/EP_PublicNotice/DavisFriesen_Draft_EIR.pdf or by written request. Appendices printed in black text (Appendices P – R) are attached to this Final EIR.

Included as Appendices to the Draft EIR:

Appendix A Notice of Preparation (NOP) and Comments Received
Appendix B Erosion Control Plan
Appendix C CalEEMod Output Files
Appendix D Biological Resources Report
Appendix E Hydrologic Analysis
Appendix F Erosion Assessment
Appendix G Engineering Geological and Geotechnical Evaluation
Appendix H Timber Harvest Plan
Appendix I Timber Conversion Plan
Appendix J Integrated Pest Management Plan
Appendix K Archeological Survey Report, CAA (Confidential)
Appendix L Technical Adequacy Letter for ECP
Appendix M Soil Reports
Appendix N Water Demand and Water Availability Analysis
Appendix O Northern Spotted Owl Report

Included as Appendices to the Final EIR:

Appendix F Erosion Assessment (reprinted with attachments)
Appendix P Bell Canyon Watershed Data
Appendix Q 60/40 Analysis

SECTION 1.0

INTRODUCTION

SECTION 1.0

INTRODUCTION

1.1 OVERVIEW

This Final Environmental Impact Report (EIR) has been prepared to address comments received by the Lead Agency, the California Department of Forestry and Fire Protection (CAL FIRE), on the Draft EIR for the proposed Davis Family, LLC Friesen Vineyards Project (Proposed Project). The Draft EIR was submitted to the State Clearinghouse and other interested parties on August 21, 2015 (SCH# 2014062076). This document, together with the Draft EIR (included by reference),[1] comprises the Final EIR.

An EIR is an informational document that must be considered by the Lead Agency prior to project approval. California Environmental Quality Act (CEQA) *Guidelines* Section 15132 specifies that the Final EIR shall consist of:

- The Draft EIR or a revision of the draft (**Section 4.0** of this Responses to Comments Document).
- Comments and recommendations received on the Draft EIR either verbatim or in summary (**Section 2.0** of this Final EIR Response to Comments).
- A list of persons, organizations, and public agencies commenting on the Draft EIR (**Section 2.0** of this Final EIR Responses to Comments).
- Responses by the Lead Agency to significant environmental points raised in the review and consultation process (**Sections 3.0** and **4.0** of this Final EIR Responses to Comments).
- Any other information added by the Lead Agency.

1.2 PUBLIC PARTICIPATION PROCESS

The CEQA environmental review process for the Proposed Project was initiated with public release of the Notice of Preparation (NOP) on June 2, 2014. The Notice of Availability (NOA) of the Draft EIR was released on August 21, 2015. The NOA initiated a 45-day public comment period that began on August 21, 2015 and ended on October 5, 2015.

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[1] The Draft EIR is available online at the CAL FIRE website:
http://calfire.ca.gov/resource_mgt/downloads/EP_PublicNotice/DavisFriesen_Draft_EIR.pdf

The public comment period under CEQA provides an opportunity for interested public and private parties to provide input regarding the completeness and adequacy of an EIR. CEQA *Guidelines* Section 15151 addresses the standards by which EIR adequacy is judged:

> An EIR should be prepared with a sufficient degree of analysis to provide decision-makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure.

CEQA *Guidelines* Section 15204(a) encourages parties to focus comments on the "sufficiency of the document in identifying and analyzing the possible impacts on the environment and ways in which the significant effects of the project might be avoided or mitigated." Commenters were advised that:

> Comments are most helpful when they suggest additional specific alternatives or mitigation measures that would provide better ways to avoid or mitigate the significant environmental effects. At the same time, reviewers should be aware that the adequacy of an EIR is determined in terms of what is reasonably feasible, in light of factors such as the magnitude of the project at issue, the severity of its likely environmental impacts, and the geographic scope of the project. CEQA does not require a lead agency to conduct every test or perform all research, study, and experimentation recommended or demanded by commenters. When responding to comments, lead agencies need only respond to significant environmental issues and do not need to provide all information requested by reviewers, as long as a good faith effort at full disclosure is made in the EIR.

1.3 DOCUMENT ORGANIZATION

This Responses to Comments Document consists of this introduction and the chapters outlined below:

> **Section 2, Comments on the Draft EIR** – This section includes a list of the agencies, organizations, and individuals that submitted written comments during the public review period for the Draft EIR. One agency, the California Department of Fish and Wildlife

(CDFW), commented on the Draft EIR. The list is followed by a copy of original written comment received during the public review period for the Draft EIR. Individual comments are bracketed in the margin.

Section 3, Responses to Comments - This section provides individual responses to each the comment submitted during the public review period for the Draft EIR. Responses are referenced to the bracketed comment numbers provided in **Section 2.0**.

Section 4, Text Revisions to the Draft EIR – This section presents any revisions to the Draft EIR text that were made in response to comments received during the public review period for the Draft EIR. These revisions are organized by the section and page number as they appear in the Draft EIR. Text that has been deleted from the EIR will be marked as a strikeout (~~deleted text~~), while new text will be underlined (new text).

Section 5, Mitigation, Monitoring, and Reporting Plan - This section presents the Mitigation Monitoring and Reporting Plan (MMRP) for the Proposed Project.

SECTION 2.0

COMMENTS ON THE DRAFT EIR

SECTION 2.0

COMMENTS ON THE DRAFT EIR

This section contains written comments that were received during the public review period of the Draft EIR prepared for the Davis Family, LLC Friesen Vineyards Erosion Control Plan Application (ECPA) #P13-00373-ECPA (Proposed Project). The Draft EIR was submitted to the State Clearinghouse (SCH# 2014062076) for public review on August 21, 2015; the comment period closed on October 5, 2015. A total of 47 comment letters were received by CAL FIRE in response to the Draft EIR during the comment period, 32 of which were from private citizens and commercial entities. The remaining 15 letters were from agencies and organizations. Of those comments, 11 expressed favorable opinions of the Proposed Project. The agencies, organizations, and individuals who provided comments on the Draft EIR are listed in **Table 2-1**. Individual comment letters are provided following this table. As discussed in **Section 1.0**, each individual letter and comment has been provided a number in the right-hand margin. This number is cross-referenced with a specific response in **Section 3.0**.

Neither the comments received on the Draft EIR nor the responses thereto indicate new significant impacts or significant new information that would require recirculation of the Draft EIR pursuant to CEQA *Guidelines* Section 15088.5.

TABLE 2-1: COMMENTS RECEIVED ON THE DRAFT EIR

Comment #	Name	Agency/Organization	Date Received
Agency and Organization Comments			
A1	Mike Hackett	Save Rural Angwin	9/10/2015
A2	Steven Palmer	City of St. Helena	9/23/2015
A3	Scott Wilson	California Department of Fish and Wildlife	9/29/2015
A4	Christina Baiocchi Aranguren	California Fisheries and Water Unlimited	10/2/2015
A5	Dan Mufson	Napa Vision 2050	10/3/2015
A6	Karin Troedsson	Napa Land Trust	10/3/2015
A7	Mike Hackett	Save Rural Angwin	10/4/2015
A8	Daniel Zador	Napa County Planning, Building and Environmental Services Department	10/5/2015
A9	Nancy Tamarisk	Napa Sierra Club Executive Committee	10/5/2015
A10	Ron Cowan	Quercus Group	10/5/2015
A11	John Cruz	Forest Unlimited	10/5/2015
A12	Daniel Zador	Napa County Planning, Building and Environmental Services Department	10/8/2015
A13	John Cruz	Forest Unlimited Logging Review	

Comment #	Name	Agency/Organization	Date Received
A14	Mike Hackett	Bell Canyon Watershed Alliance	11/9/2015
A15	April Rose Sommer	Center for Biological Diversity	11/9/2015
Private Party Comments			
P1	Dick Crain		7/30/2015
P2	David Graves		9/25/2015
P3	Dick Crain		9/28/2015
P4	Donald and Joanne Yates		9/28/2015
P5	Michael Heffner		9/28/2015
P6	Michelle MacKenzie		9/28/2015
P7	Robin Lail		9/28/2015
P8	Kara Dunn	Retro Cellars	9/30/2015
P9	Gary Dowling		9/30/2015
P10	Tracey Hawkins		10/1/2015
P11	Lisa Hirayama		10/3/2015
P12	Ken Stanton		10/3/2015
P13	Larry Carr		10/4/2015
P14	Linnea Carr		10/5/2015
P15	Kellie Anderson	Mountain Mutual Water Company	10/5/2015
P16	Shelle Wolfe	Wine+Dine Events	10/5/2015
P17	Norm & Linda Manzer		10/5/2015
P18	Carie Dunn	Davis Estates	10/5/2015
P19	Marietta Dunn		10/5/2015
P20	Davie Pina	Pina Vineyards	10/5/2015
P21	Rod Field		10/5/2015
P22	Cary Gott	Vineyard and Winery Estates	10/5/2015
P23	Arthur Della Bruna		10/5/2015
P24	Kevin Dickenson		10/5/2015
P25	Rich & Leslie Frank	Frank Family Vineyards	10/5/2015
P26	Stuart Smith	Smith-Madrone Vineyards & Winery	10/5/2015
P27	May-Britt Malbec	Notre Vin	10/5/2015
P28	Louis Ciminelli	LPCiminelli	10/5/2015
P29	Jim Wilson		10/5/2015
P30	Chris Jambois	Black Sears	N/A
P31	Grete Orsoe		10/6/2015
P32	Geoff Ellsworth		11/9/2015

UNIT, ER, LM, RPF

From: Sone, Kim@CALFIRE
Sent: Thursday, September 10, 2015 2:46 PM
To: Santa Rosa Public Comment@CALFIRE
Cc: mike hackett
Subject: FW: Davis/Friesen THP 1-15-081
Attachments: Cal fire #1.docx

Please include the attached public comment for the file to THP 1-15-081 NAP.

Kimberley Sone
Unit Forester
CAL FIRE
Sonoma-Lake-Napa Unit
2210 West College Ave
Santa Rosa, CA 95403
(707) 576-2344 office
(707) 889-4217 cell

From: mike hackett [mailto:mhackett54@gmail.com]
Sent: Thursday, September 10, 2015 12:36 PM
To: Scott.Butler@sbcglobal.net; Sone, Kim@CALFIRE
Subject: Davis/Friesen THP 1-15-081

Please see the attached document concerning the THP (conversion) and share with appropriate agencies. Thanks very much. A1-01

RECEIVED
SEP 10 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

To: Kimberly Sone, Cal Fire

From: Mike Hackett, Chairman Save Rural Angwin

September 9, 2015

Subject: Davis/Friesen THP 1-15-081 NAP

RECEIVED
SEP 10 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

Save Rural Angwin a political action group, comprised of over 1,500 citizens who reside mostly in Angwin, the Howell Mountain area of Napa County. We are concerned, along with the residents of St. Helena, about the Davis project and its impact on the water quality and quantity as it affects the watershed for Bell Canyon Reservoir and Angwin.

Some of the parcel shares a small lake with the Dunn-Wildlake Preserve. The Preserve protects over 3,000 contiguous acres immediately adjacent to this potential clear cut/vineyard conversion and is overseen by the Land Trust of Napa County. This small lake (sometimes referred to as No Name Lake, or Peck Lake), is in the Howell Mtn. watershed and can also affect the water supply to the Friesen Lakes which are the water source for over 400 families in Angwin. A1-01 (Cont.)

The PHI was held August 25, and unfortunately we were unaware that this was occurring. Had we known, we certainly would have offered some salient information that would have been constructive to the discussion. **However, a larger concern is that the California Statutory Water Rights Law mandates that the S F. Bay Regional Water Quality Control Board should have been in attendance.** They were not, and therefore, we believe the findings of that meeting are null and void and should be repeated with their representative in attendance. **We also believe the State Water Resources Control Board should be involved also**, as this issue involves the water rights to Bell Canyon Reservoir. A1-02

Additionally, the Land Trust element,

We feel that concurrent dates for the THP and DEIR Public Comment Period would be helpful and the time limit extended, as our legal team has just received this information and will be hard-pressed to get the analysis reviewed in time to allow the public to weigh in on this critical decision. A1-03

Mike Hackett

707 965-9640 or (c) (707) 738-0273

Comment Letter A2

William Solinsky,

The City has reviewed the Draft EIR for the above referenced project and is submitting the attached comments.

Will you please respond so that the City has confirmation that these comments were received.

Should you have any questions, please feel to contact me at 707.312.0259.

A2-01

Thanks,

Steven Palmer, PE
Director of Public Works & City Engineer City of St. Helena
1480 Main Street
St. Helena, CA 94574

Office: 707-968-2624
Mobile: 707-312-0259

City of St. Helena
"We will conduct city affairs on behalf of our citizens using an open and creative process."

1480 Main Street
St. Helena, CA 94574
Phone: (707) 967-2792
Fax: (707) 963-7748

www.cityofsthelena.org

September 23, 2015

California Department of Forestry and Fire Protection
PO Box 944246
Sacramento, CA 94244-2460

RE: Draft Environmental Impact Report for the Davis Family Estates Friesen Vineyard Project

The City of St Helena has reviewed the Draft Environmental Impact Report (DEIR) for the Davis Family Estates Friesen Vineyard Project. This Project is within the watershed of the primary drinking water source for the resident's of the City of St Helena, Bell Canyon Reservoir. The City relies on Bell Canyon Reservoir for nearly 50% of its potable drinking water supply. Consequently, it is imperative that the watershed of this reservoir be managed to protect the health and life safety of the residents of the City of St Helena.

The City has the following comments on the DEIR:

1. The Project Summary, Executive Summary, and Project Description do not reference the fact that this project lies within the watershed of the City's drinking water supply, Bell Canyon Reservoir. These elements of the analysis must include acknowledgement of this fact, and identify that the pertinent analysis and accommodations are included in the DEIR document. Specifically, the analysis must discuss and address Project impacts on St. Helena drinking water resulting from sediment loading and impacts to the volume of water to the Bell Canyon Reservoir as well as pesticide, herbicide and fertilizer use on the vineyard. A2-01 (Cont.)
2. Section 4.9, Bell Canyon Watershed subheading needs a discussion regarding Bell Canyon Reservoir as the primary source of drinking water for the City of St Helena.
3. Section 4.9, Surface Water Quality/Sediment Loading subheading discussion of Bell Canyon Dam as a means to reduce sediment loading to the Napa River is inappropriate. Bell Canyon Reservoir is the primary drinking water supply for the city of St. Helena and this project shall not increase sediment loading to Bell Canyon Reservoir. Specific impact analysis and any required mitigations must be specifically included and identified in the DEIR document. Mitigation should include a requirement to monitor water quality, sediment and agricultural chemicals, upstream and downstream of the Project. A2-02
4. Section 4.9, Subheading Finding, Project shall not reduce the volume of water flowing to Bell Canyon Reservoir. This must be supported by the appropriate hydrologic modeling, analysis and documentation. A2-03
5. Section 4.9, Subheading Chemical Loading, the City opposes any increase in the use of chemicals in the watershed of Bell Canyon Reservoir. A2-04

6. Section 5.0, the City supports the No Project Alternative and No Timber Harvest Alternative as Environmentally Superior. A2-05
7. The water supply analysis does not appear to include water used for frost protection. DEIR should identify frost protection measures and quantify the amount of water used for frost protection. A2-06
8. The Hydrologic Analysis should be prepared under responsible charge of a registered a Civil Engineer, and signed and sealed by the engineer. A2-07
9. The Erosion Analysis is missing Appendix A. This missing information is critical in order to evaluate the appropriateness of this analysis. This analysis also needs a discussion and supporting documentation as to why the project will actually decrease the sediment loading to Bell Canyon watershed (as claimed by the current document). At a minimum the analysis must be supplemented and modified to include the requested information. A2-08
10. The Project analysis does not fully identify potential Project impacts without the information and analysis requested above. Please revise the document and re-post for the required Public Review and Comment period.

The City appreciates the opportunity to comment on this DEIR. Should you have any questions, please feel to contact me at (707) 968-2624.

Sincerely,

A2-09

Steven Palmer, PE
Director of Public Works/City Engineer

cc: Analytical Environmental Services
1801 7th Street, Suite 100
Sacramento, CA 95811

Jennifer Phillips, City Manager

State of California
Department of Fish and Wildlife

Memorandum

Date: September 29, 2015

To: Mr. William D. Solinsky
California Department of Forestry and Fire Protection
Post Office Box 944246
Sacramento, CA 94244-2460

From: Scott Wilson, Regional Manager
California Department of Fish and Wildlife – Bay Delta Region, 7329 Silverado Trail, Napa, California 94558

Subject: Davis Family, LLC Friesen Vineyards Project, Draft Environmental Impact Report, SCH #2014062076, Town of Angwin, Napa County

This memorandum is intended to summarize the California Department of Fish and Wildlife's (CDFW) review of the Davis Family, LLC Friesen Vineyards Project (Project) draft Environmental Impact Report (EIR). CDFW is submitting comments on the draft EIR to the California Department of Forestry and Fire Protection (CAL FIRE) as the Lead Agency, regarding potentially significant impacts to botanical, wildlife and fisheries resources associated with the proposed Project. The draft EIR was received in our office on August 25, 2015.

CDFW is a Trustee Agency with responsibility under the California Environmental Quality Act (CEQA) §15386 for commenting on projects that could impact fish, plant and wildlife resources. CDFW is also considered a Responsible Agency if the project would require discretionary approval related to the California Endangered Species Act (CESA; Fish and Game Code, § 2050 et seq.), the Native Plant Protection Act, the Lake or Streambed Alteration Program (Fish and Game Code, §§ 1600 – 1616) and/or other provisions of the Fish and Game Code. Pursuant to our jurisdiction, CDFW has the following concerns, comments, and recommendations regarding the Project and draft EIR.

A3-01

CDFW previously provided comments on the Notice of Preparation (NOP) for the Project in a letter dated July 22, 2014. In addition, CDFW provided comments on the Administrative Draft EIR for the Project in a memorandum dated January 30, 2015. CDFW also participated in the review of the associated 1-15-081 NAP Timber Harvest Plan (THP).

PROJECT DESCRIPTION

The proposed Project is located at 1875 Friesen Drive in the Town of Angwin in Napa County. According to the draft EIR, the Project would convert 13.6 acres of undeveloped land on a 38.7-acre property to an agricultural vineyard. Ten acres of the conversion area is forested timberland and the remaining 3.6 acres of conversion area consists of manzanita and chaparral scrub and ruderal land. Prior to the vineyard development, the timberland would be harvested and the brush would be cleared under a THP. The property is zoned for agricultural use; therefore, no rezoning would be required. The Project proponents must obtain an approved THP and Timberland Conversion Permit (TCP) from CAL FIRE, and submit an Erosion Control Plan (ECP) to the County of Napa for review and approval.

BIOLOGICAL IMPACTS AND MITIGATION MEASURES

Mitigation Measure 4.4-1

Approximately 5.32 acres of mixed oak alliance would be directly impacted by Project implementation. Mitigation Measure 4.4-1 proposes to create 13.1 acres of Habitat Retention Area (HRA) on the property to compensate for the permanent loss oak woodland habitat within the conversion area. To indicate that the habitat would be retained, the draft EIR cites compliance with Napa County Ordinance No. 1219, which states that a parcel must maintain 60 percent of tree canopy and 40 percent of shrub canopy as part of development activities relative to June 1993 baseline conditions. However, Napa County Ordinance No. 1219 would not provide protection of the mitigation land in perpetuity, as local ordinances can be modified or extinguished at any time through unilateral action by the County. CDFW recommends that deed restrictions, easements or other legally-binding protections be applied to mitigation sites to protect the habitat in perpetuity. If no meaningful, binding protection of the HRA is provided, the Project may result in a net loss of habitat. A3-02

Mitigation measure 4.4-1 also proposes compensation for loss of oak woodland habitat with an oak tree replacement or preservation ratio of 2:1, as required by the Napa County General Plan Policy CON-24. The draft EIR describes retention and enhancement activities proposed to be employed within the HRA to improve wildlife habitat and meet the 2:1 retention ratio. Activities include the enhancement of 9.6 acres of habitat by reducing competing botanical species to allow existing oak seedlings to grow and dominate.

Due to rapid and extensive land conversions of oak woodlands within Napa County, CDFW is concerned about the long-term survival of the native oaks following enhancement activities. Native oak trees typically have very slow growth rates and can take years to establish into a healthy and viable woodland ecosystem. Combined with the State's ongoing drought situation, establishment can be a lengthy process. The mitigation measure details specific enhancement activities but does not address the long-term management and monitoring of these habitat improvements to ensure success of the reestablishment of the existing oak seedlings. The goal of the mitigation should be to recreate functioning habitat of similar composition, structure, and function to the oak woodland that was impacted. Measurable success criteria (based on present site conditions and/or functional local native woodlands as reference sites) should be part of the plan to ensure that native oaks become established on the mitigation site to meet the 2:1 retention ratio. Without a long-term management plan, it is unclear if the proposed mitigation will adequately reduce the impacts to loss of oak woodlands to less-than-significant. A3-03

CDFW recommends implementing a long-term management plan for enhancement activities proposed within the HRA. The plan should describe management activities that will be employed to facilitate oak recruitment; alternatives if oak seedlings do not respond to enhancement activities, evaluations of any potential impacts associated with habitat enhancements, and incorporate a monitoring plan that includes a measurable success criterion before the mitigation should be deemed a success. The plan should also determine who will be responsible for implementation and identify funding sources to conduct management activities.

Mitigation Measure 4.4-3

Mitigation Measure 4.4-3 proposes to mitigate for impacts to Napa lomatium (*Lomatium repostum*) populations by creating a seed retention plan. The draft EIR states that plants shall be transplanted by a qualified biologist to an ecologically suitable area within the buffer zone around the pond. However the mitigation does not include a plan to determine if the plants successfully establish. Considerable expense and risk are always involved when moving individual plants or seeds from one location to another. Successful implementation of translocation is rare and this lack of success has been documented in case studies (Fiedler 1991; Howald 1996). Reasons for failure of translocation projects include inadequate plans, inadequate implementation, or lack of adequate or appropriate monitoring. In the absence of appropriate minimal documented success, translocation is experimental at best; at worst, it results in the unmitigated loss of a species. A3-04

The draft EIR should consider a monitoring plan for a period that is long enough to ensure a successful transplantation effort. Before replanting, the following factors should be considered to achieve successful transplantation: habitat suitability, probability of success, and long-term protection and management needs (including additional watering, weeding, invasive exotic eradication, funding sources, etc.). Without such monitoring, it is unclear if the proposed mitigation will adequately reduce the impacts to Napa lomatium to less-than-significant.

Habitat Fragmentation and Wildlife Movement

Impact 4.4-9 states that development of the project could interfere with existing wildlife movement. To reduce impacts to a less-than-significant level, implementation of Mitigation Measure 4.4-1 (creation of the HRA) will improve wildlife corridors and habitat fragmentation. Therefore, no mitigation is proposed.

The proposed HRA, as shown in Figure 4.4-3, appears to be highly fragmented, with development concentrated in the center and along the western edge of the property. As shown in Figure 3-3, the majority of proposed vineyard blocks will be concentrated in the western and southern portion of the property, which has potential to significantly limit east to west movement for wildlife and concentrate movement toward the south. The 3,030-acre Dunn-Wildlake Ranch Preserve, managed by the Land Trust of Napa County, is located to the west, south and east of the property. The preserve is adjacent to the west and east borders of the property. A3-05

The fragmentation of habitat reduces the value and connectivity of retained areas for wildlife as well as limiting the habitat's ability to provide a full range of ecological benefits, including maintenance of species diversity, erosion control, precipitation interception and infiltration, and nutrient cycling. In evaluating the impacts of the Project on wildlife movement, the draft EIR focuses on the installation of wildlife exclusion fencing, drainage setbacks and the un-fenced corridors between proposed vineyard blocks. The draft EIR states that vineyards themselves do not constitute barriers to wildlife movement, however to move safely from one habitat area to another, wildlife species require protective cover, visibility, and sensory cues. Areas designated as wildlife movement corridors should provide appropriate conditions to support existing and future movement. Features that would introduce disturbance within a wildlife corridor may reduce the value of a corridor for species not

adapted to agricultural environments. Vineyards provide limited foraging, cover and breeding habitat, may support a reduced number of species, and may be incompatible with surrounding wildlife habitat. Additionally, if enhancement activities within the HRA are unsuccessful, wildlife movement to suitable habitat within the property becomes limited.

The draft EIR should consider geographic connectivity between existing open space habitat. CDFW recommends retaining larger un-fragmented areas connecting the east and west boundaries of the adjacent to the Napa Valley Land Trust property to facilitate better wildlife movement through the Project.

CDFW appreciates the opportunity to provide comments on the draft EIR. If you have any questions about the contents of this memorandum, please contact Ms. Robynn Swan, Environmental Scientist, at (707) 944-5586 or Robynn.Swan@wildlife.ca.gov; or Ms. Randi Adair, Senior Environmental Scientist (Supervisory), at (707) 944-5596. A3-05 (Cont.)

REFERENCES

Fiedler, P.L. 1991. Mitigation-Related Transplantation, Relocation and Reintroduction Projects Involving Endangered and Threatened, and Rare Plant Species in California. Final Report (unpublished).

Howald, A.M. 1996. Translocation as a mitigation strategy: Lessons from California. In: Falk D.A., C.I. Millar, and M. Olwell, editors. Restoring Diversity: Strategies for Reintroduction of Endangered Plants. Island Press, Washington, DC, pp. 293 – 329.

Comment Letter A4

UNIT, FG, WQ, ER, LM, RPF

From: California Fisheries & Water Unlimited <calfisheriesandwaterunlimited@gmail.com>
Sent: Friday, October 02, 2015 1:39 PM
To: Lichten, Keith@Waterboards; Farres, Agnes@Waterboards; Seward, Terry@Waterboards
Cc: Santa Rosa Public Comment@CALFIRE
Subject: THP 1-15-081 NAP

San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Mr. Keith Lichten
Division Chief, Watershed Management

Ms. Agnes Farres
Environmental Scientist, Napa County

Mr. Terry Seward
Supervisor, Groundwater Resources Control Engineer

RECEIVED
OCT -2 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

California Department of Forestry and Fire Protection
Regional Office, Northern Administration
135 Ridgeway Avenue
Santa Rosa, CA 95401

Mr. Peter Leuzinger
Review Team Chair, Forest Practice

Ms. Leslie Markham
Deputy Chief, Forest Practice

October 1, 2015

Re: Conversion/Timber Harvest Plan 1-15-081 NAP

Mr. Lichten, Ms. Farres, Mr. Seward, and Participating Agencies;

A controversial timber harvest plan (CONV/THP 1-15-081 NAP), located in rural Napa County near the community of Angwin, has recently been brought to the attention of California Fisheries & Water Unlimited. This plan for conversion from undeveloped wildland to vineyard installation is currently under consideration for approval by the California Department of Forestry and Fire Protection; a Pre-Harvest Inspection was held August 25, 2015. It is my understanding that although the site borders sensitive Napa Land Trust Property on two sides and is located within the Bell Canyon Reservoir Watershed, sub-watershed of the Napa River Watershed, near blue-line tributaries and will utilize groundwater for irrigation and frost protection needs, that the San Francisco Bay Regional Water Quality Control Board did not attend the PHI and has not

A4-01

submitted recommendations or provided comment to date. If this is not the case, please do not hesitate to correct me. A4-01 (Cont.)

CF&WU remains concerned with the potential for adverse cumulative impacts to water quality and water quantity that this plan and subsequent project may have upon the Bell Canyon Reservoir Watershed, including impacts to hydrologically-connected surface waters, stream underflow, and the potential for erosion and sedimentation and nutrient runoff to adjacent watercourses, lakes, and the greater Napa River Watershed. Pursuant to the Clean Water Act, the Napa River is 303(d) listed for sediments, nutrients, and pathogens and remains in decline; four years of extended drought conditions are not assisting. While the plan area does not contain anadromous salmonids, the plan is located upstream from watersheds with listed anadromous salmonids; the THP must incorporate for their protection. Consistent with the spirit of the Porter-Cologne Water Quality Control Act, "Problems must be anticipated, the necessary information and data obtained and plans formulated *in advance*." A4-02

To that end, CF&WU respectfully submits the following questions and concerns:

1. Is the Oregon-based RPF for this THP familiar with regulations for California's Sustainable Groundwater Management Act of 2014? If so, how do they specifically address CONV/THP 1-15-081 NAP to insure future compliance? A4-03

2. Are all cumulative watershed impacts to protect the beneficial uses of the State's waters of the Napa River watershed calculated? if so, please forward the methodology and data that support the conclusion(s). A4-04

3. What is the evidence that decreasing the forest canopy at this site will not increase surface flows and cause and/or contribute to sheet and gully erosion? A4-05

4. How will road use or reconstruction contribute additional sediment to adjacent tributaries? A4-06

5. What are the average normal rainfall totals at the CONV/THP site? A4-07

6. What are the rainfall totals for Water Years 2012 through 2015 at the CONV/THP site?

7. How will groundwater be affected by the removal of trees? In a normal rainfall year? In extended drought conditions, including Water Years 2012 through 2015? A4-08

8. Given the recent experience of the Valley Fire of Lake, Napa, and Sonoma Counties, what is the established relative fire danger of the THP area?

9. What is the threshold value used to determine the significant cumulative effects of the CONV/THP area for fire danger?

10. Will fire danger in the CONV/THP area exceed the threshold value as a result of this cut? A4-09

11. If any potential for wildfire conditions exist, why is the burning of slash being considered at the CONV/THP site?

12. If a wildfire is created by the burning of slash and/or other logging practice(s), what are the specific measures that will be taken to insure for the health, safety, and welfare of Napa Valley residents and their property?

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13. Is adequate water available for fire suppression purposes adjacent the CONV/THP site? If so, where will the water originate? How much can be guaranteed? For a wildfire of how many specific acres? When complete, please forward the methodology and data that support the conclusion(s).

14. If water for fire suppression and/or emergency purposes is to be drawn from municipal water sources, what are the cumulative adverse effects its use may have on the municipal water supply and its waters users, especially in multiple dry water years when water emergencies may be in effect? A4-10

15. Have any of the above parameters been quantified? What are the specific increases or decreases in fire danger due to the cut? Please forward the methodology and data that support the conclusion(s).

16. If seeding with grasses is planned to prevent erosion resulting from the conversion, what is the type specified and how will it effect the probability of fire? A4-11

17. How is air quality expected to be effected by the burning of slash? In each weather type? In each season of the year that the cut may occur?

18. What are the mitigation measures considered to offset CO2 emissions created by the proposed CONV/THP with regard to the degradation of carbon sequestration created from the removal of trees and plant life? A4-12

19. Are all adverse effects to hydrological, biological, economic, and fire-related resources associated with climate change calculated for the CONV/THP? When complete, please forward the methodology and data that support the conclusion(s). A4-13

The timing of this request is poor. Water Year 2015 will be remembered as the fourth year of one of the state's most severe dry periods on record - as well as one with tremendous losses due to wildfire. As of yesterday, Water Year 2015 has concluded a fourth consecutive year of below-average rainfall and very low snowpack, according to the U.S. Drought Monitor. The statewide snowpack on April 1, 2015 held only 5% of the average water content on that date in records dating to 1950. The previous low record of 25% of average was set in 1977 during one of California's most significant droughts and was tied in 2014. Of the nine April 1 snowpack values below 50% of average since 1950, three have occurred in the past three years of drought. With Napa's groundwater originating in the Auburn area and with a fifth - or additional years - of drought a possibility, conservation of state resources must be a top priority. In addition, eight of the last nine years, including Water Year 2015 have had below average runoff which has resulted in chronic and significant shortages to municipal, industrial, and wildlife refuge supplies and historically low stream flows and groundwater levels. As a result of the drought conditions, on January 17, 2014, Governor Brown issued a proclamation of a State of Emergency and directed the State Water Board and other agencies to take various actions to respond to the crisis. The Governor has since issued additional Proclamations extending and expanding the provisions of prior Proclamations. A4-14

With state water issues this critical, CF&WU is requesting the attention of all participating agencies to CONV/THP 1-15-081 NAP and urges that an additional PHI be scheduled which includes the participation of the San Francisco Bay Regional Water Quality Control Board. With tentative close of comment for this plan scheduled for October 5, 2015, CF&WU also requests that an extension be issued immediately so that all agencies have the opportunity to participate, make recommendations, and for California residents to submit further comment.

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Respectfully submitted,

A4-14
(Cont.)

Christina Baiocchi Aranguren
California Fisheries & Water Unlimited

bcc:
Interested parties

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RESOURCE MANAGEMENT

Subject:	Regarding: 1-15-081 NAP
From:	Daniel Mufson (napavision2050@gmail.com)
To:	Scott.Butler@sbcglobal.net; Kim.Sone@fire.ca.gov;
Date:	Saturday, October 3, 2015 4:56 PM

Dear CalFire: I am writing to you on behalf of the members of the Napa Vision 2050 Coalition of 15 environmental and community groups in Napa County. We have learned of the pending application for Davis Family-Friesen Lake timber harvest plan and wish to voice our objection to this program. Following the tragic Valley Fire nearby, and the fourth year of the drought, it is hard to imagine any good coming from active deforestation of our hills—especially those that so clearly are an integral part of our watersheds.

At a minimum we would ask you to extend the comment period on this application to give us, and others, the chance to comment in depth. A5-01

Thank you,
Dan Mufson, President
Napa Vision 2050

www.NapaVision2050.org

Land Trust
OF NAPA COUNTY

October 3, 2015

William Solinsky, Forester III — via email
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Dear Mr. Solinsky, Ms. Markham and Mr. Zador:

For the first time in our 40-year history, The Land Trust of Napa County is submitting the enclosed comment letter regarding a pending application for vineyard development. Our comments concern the Timber Conversion Plan, Timber Harvest Plan, Erosion Control Permit and Draft Environmental Impact Report for the Davis Frostfire Friesen Vineyard Project. The Land Trust is submitting this letter as a concerned neighbor that abuts this proposed project both on the east and on the west.

A6-01

It is important to note that The Land Trust holds numerous agricultural conservation easements on vineyard lands throughout Napa Valley, protecting important agricultural resources and open space. We greatly value those easements and the landowners who have worked with us to permanently protect these important agricultural properties. These comments do not represent a change in our goal of permanently protecting working agricultural lands in Napa County. In fact, that is one of our top priorities as highlighted in our recently-completed Strategic Plan, and we look forward to working with many more landowners who wish to protect their Napa vineyards in perpetuity.

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Our comments on this particular project are based solely on its location and its unmitigated impacts on our Dunn-Wildlake Preserve ("Preserve") and the regionally significant wildland area of which it is part. The 3,030-acre Preserve contains a complex mosaic of several forest, scrub and grassland plant communities, and a diverse suite of wildlife species that rely on those habitats. Further, the preserve is contiguous with a number of other protected conservation areas managed by California State Parks, Bureau of Land Management, California State Land Commission, LTNC, and the Biological Field Studies Association. This area has been a recognized priority for conservation because it contains some of the highest plant and animal diversity in Napa County, which itself has some of the highest biological diversity levels in the United States.

The natural resource values are so high in this area that the protection of the Preserve was funded by a number of public agencies, such as the California Wildlife Conservation Board, the California Department of Fish and Wildlife, the California State Coastal Conservancy, by leading charitable foundations including the Gordon and Betty Moore Foundation and the Packard Foundation, and by a large number of prominent Napa County residents who contributed generously to protect this land. The Preserve was therefore purchased for the benefit of residents of Napa County and all Californians today and into the future. In addition to its significant natural values, the Preserve is used for hiking, environmental education, and scientific research because of its outstanding natural resources. A6-01 (Cont.)

In sending these comments, it is also important to point out that over the years, including very recently, there have been other applications for development on parcels that abut Land Trust lands. After review of those applications, we elected not to comment. However we feel we have an obligation to comment on this project for the reasons set forth above. Additionally, the applicant, in their Timber Conversion Plan, improperly indicated that The Land Trust does not object to their application, and we feel an obligation to publicly correct that misrepresentation. (TCP at page I-16)

Thank you for your careful consideration of the attached comments. We welcome an open dialogue with you and the applicant at any time.

Sincerely,

Karin Troedsson
Staff Attorney

Enclosure

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October 2, 2015

Via E-Mail and FedEx

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Re: **Comments on Timber Conversion Plan, Timber Harvest Plan, and Draft Environmental Impact Report for Friesen Vineyard Project**

Dear Ms. Markham and Mr. Solinsky:

We submit this letter on behalf of the Land Trust of Napa County. The Land Trust retained our office to assess the legal adequacy of the Draft Environmental Impact Report ("DEIR"), the Timber Conversion Plan ("TCP"), and the Timber Harvest Plan ("THP") prepared and submitted for the Friesen Vineyard Project. We worked with and relied on the technical expertise of Land Trust staff and consultants to evaluate the DEIR, the TCP, and the THP. This letter incorporates the comments and personal observations of staff and a consultant with expertise in specific areas addressed by these documents and familiar with the project area, including Mike Palladini, the Land Trust's Land Stewardship Manager, (*see* Attachment 1), and Jake Ruygt, principal of Napa Botanical Services (*see* Attachment 2). A6-02

Based on our review, we conclude the DEIR, TCP, and THP violate numerous requirements of the California Environmental Quality Act (Public Resources Code

section 21000 *et seq*., "CEQA"), the Forest Practice Act (Public Resources Code section 4511 *et seq*.) and the Forest Practice Rules (title 14 California Code of Regulations section 895 *et seq*. (collectively, "Forest Practice Act").[1] As a result of these flaws, CAL FIRE cannot legally certify the DEIR or approve the TCP or THP. A6-02 (Cont.)

The most fundamental flaw in these documents is their failure to comply with these laws' mandates to provide an accurate account of the environmental setting surrounding the two parcels that have been proposed for vineyard development ("Property"). The Land Trust owns permanently protected natural areas immediately to the east and west of the Property, and the Property is otherwise surrounded by undeveloped, undisturbed habitat. In fact, the Property lies within a regionally significant, 12,000-acre wildland complex that includes lands managed by California State Parks, the California State Lands Commission, the Bureau of Land Management, the Land Trust, and the Biological Field Studies Association. Despite this fact, the DEIR, TCP, and THP all give the incorrect impression that the Project sits in a predominately agricultural area, and improperly attempt to minimize the conservation value of the surrounding lands.

These documents compound this error by failing to accurately describe, analyze, and mitigate foreseeable impacts to the biological and aesthetic resources surrounding the Property. For instance, while the Project would cut down the majority of the oak woodlands existing on the Property, it proposes measures that are not only insufficient to mitigate this impact, but would actually cause further habitat destruction and harm to biological resources on the Project site. The documents also overlook, or fail to properly assess and mitigate, impacts to numerous special-status species that have either been observed on the Property, or are known to exist in the area. And the documents do not A6-03

[1] While THPs are exempt from the requirements in chapters 3 and 4 of CEQA, as well as Public Resources Code section 21167, they must comply with every other requirement of the statute. *Joy Road Area Forest and Watershed Association v. California Department of Forestry and Fire Protection* (2006) 142 Cal.App.4th 656, 667; *Sierra Club v. State Bd. of Forestry* (1994) 7 Cal.App.4th 1215, 1228-31. Thus, a THP must comply with CEQA's requirement to accurately describe a project and its environmental setting and assess the environmental impacts of that project. Additionally, the Forest Practice Rules separately require THPs to evaluate alternatives to a project (*see* 14 C.C.R. § 896), a project's cumulative impacts (*see* 14 C.C.R. § 895.1), and impacts to flora and fauna (*see* 14. C.C.R § 895.1). Because the Friesen DEIR and THP cross reference each other and the same technical appendices, and much of the information and analysis in these documents are identical, for ease of reference, this letter applies to all three documents but focuses on and cites to the DEIR.

consider the significant aesthetic impacts that construction and operation of the Project will have on visitors to the Land Trust's Dunn-Wildlake Preserve.

The documents contain numerous other legal inadequacies. For instance, they fail to properly evaluate fire hazards associated with operating the Project and numerous conflicts between the Project and Napa County's General Plan and ordinances. Similarly, the documents almost uniformly refuse to properly analyze cumulative impacts that could result from the Project. Nor do they properly evaluate existing, feasible alternative proposals that could significantly decrease many of the Project's environmental impacts. Without remedying these and other defects, CAL FIRE may not legally approve the proposed TCP and THP for the Friesen Project. A6-03 (Cont.)

I. The DEIR Provides an Incomplete and Misleading Description of the Project and Project Setting.

CEQA's most fundamental requirement is that an EIR contain an accurate and complete project description. *See County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185; *see also* 14 C.C.R. § 15124 (hereinafter "CEQA Guidelines"). CEQA defines a "project" as "the whole of an action." CEQA Guidelines § 15378. As explained in *McQueen v. Board of Directors of the Midpeninsula Regional Open Space District* (1988) 202 Cal.App.3d 1136, "'[p]roject' is given a broad interpretation in order to maximize protection of the environment." *Id.* at 1143. This rule ensures "that environmental considerations do not become submerged by chopping a large project into many little ones—each with a potential impact on the environment—which cumulatively may have disastrous consequences." *Bozung v. Local Agency Formation Comm.* (1975) 13 Cal.3d 263, 283-84. The Forest Practice Act contains similar requirements. *See* Pub. Res. Code § 4582(c). Without a complete project description, an agency and the public cannot be assured that all of a project's environmental impacts have been revealed and mitigated. A6-04

An essential defect of this DEIR is its failure to accurately describe the Project and its environmental setting. For example, the DEIR's description of the project does not accurately or consistently describe the slope of the site. Notably, images and topographic maps in the DEIR show that the Property is perched on a steep hillside within the Howell Mountains. DEIR Figure 3-4, 4.1-1. Yet the DEIR consistently downplays the steepness of the site, stating that "Existing slopes on the property generally range from 8 to 27 percent; less than 1 acre contains slopes of 30 percent or greater." DEIR 2-1. Documents in the applicants' own soil report demonstrate that this assertion is wrong. Far more than 1 acre of the Property is situated on slopes that exceed 30 percent, including some areas slated for vineyard development. *See* Attachment 3. In fact, large areas of the Property contain slopes that exceed 50 percent. The DEIR's inaccurate description of the steepness

of the Property is more than academic. As the DEIR recognizes, the County's Conservation Regulations prohibit development on slopes of this steepness. DEIR 4.10-5. And even if permitted, leveling and preparing the vineyard sites for planting would require significant rock scraping, earthwork, and blasting, which the DEIR never describes nor quantifies. Without such analysis, it is impossible to understand the scale of the construction required to build the Project, or its attendant environmental impacts.

A6-04 (Cont.)

In addition to being inaccurate, the DEIR's description of slopes on the Property continually shifts. In places, the DEIR concedes that slopes over 30 percent exist on the Property (*see, e.g.,* DEIR 2-1, 4.4-15), but in other places it omits this fact, suggesting that slopes onsite range only from 5 to 27 percent (*see, e.g.,* DEIR 3-5, 4.1-1, 4.9-2). This continually changing description of the site contravenes CEQA's requirement that an DEIR contain an accurate and stable project description. *City of Santee v. County of San Diego* (1989) 214 Cal.App.3d 1438, 1454. The DEIR must be revised to reconcile these internally inconsistent statements.

Similarly, though it is a necessary component of implementing the Project, the DEIR lacks a full description of the Erosion Control Plan ("ECP"), and as a result, fails to analyze the environmental impacts that will occur from implementing the ECP. The DEIR anticipates that the ECP will be implemented after the Project's vineyard blocks are developed (DEIR 3-6), but does not acknowledge that this work "may be phased over several years." DEIR, Appendix B. Nor does the DEIR's Project description disclose the ECP will extend beyond the footprint of the proposed vineyard blocks, or that multiple aspects of the ECP will have foreseeable environmental impacts, including ripping and blasting of bedrock, and introduction of non-native cover crops. *Id.* The DEIR must first fully describe these Project components and when they are expected to occur, and then evaluate their foreseeable environmental impacts. Until it cures these and other defects in its Project description, the DEIR cannot "adequately apprise" either CAL FIRE or the public of the true scope of the Project and its environmental impacts. *City of Santee*, 214 Cal.App.3d at 1454.

A6-05

II. The DEIR's Analysis of the Project's Environmental Impacts and Required Mitigation Does Not Comply with CEQA or the Forest Practices Act.

The discussion of a proposed project's environmental impacts is at the core of an EIR and the functional equivalent required by the Forest Practices Act. *See* CEQA Guidelines §15126.2(a) ("[a]n EIR *shall* identify and focus on the significant environmental effects of the proposed project") (emphasis added). As explained below, the DEIR's environmental impacts analysis is lacking because it fails to provide the necessary facts and analysis to allow CAL FIRE and the public to make informed decisions about the Project. An EIR must effectuate CEQA's fundamental purpose: to

A6-06

"inform the public and responsible officials of the environmental consequences of their decisions before they are made." *Laurel Heights Improvement Ass'n v. Regents of University of California* (1993) 6 Cal.4th 1112, 1123. To do so, an EIR must contain facts and analysis, not just an agency's bare conclusions. *Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 568. Thus, a conclusion regarding the significance of an environmental impact that is not based on an analysis of the relevant facts fails to fulfill CEQA's informational mandate.

A6-06 (Cont.)

Additionally, an EIR must identify feasible mitigation measures to mitigate significant environmental impacts. CEQA Guidelines §15126.4. Under CEQA, "public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects . . . ." CEQA § 21002. Although the proposed Project has the potential to cause significant environmental degradation, the DEIR does not provide decision-makers or the public with detailed, accurate information about the Project's significant environmental impacts or properly analyze mitigation measures to reduce or avoid such impacts.

A. The DEIR's Analysis and Proposed Mitigation of Potential Aesthetic Impacts Is Inadequate.

CEQA establishes the state's policy to "[t]ake all action necessary to provide the people of this state with . . . enjoyment of *aesthetic*, natural, scenic, and historic environmental qualities." CEQA § 21001(b) (emphasis added). Thus, courts have recognized that aesthetic issues "are properly studied in an EIR to assess the impacts of a project." *Pocket Protectors v. City of Sacramento* (2004) 124 Cal.App.4th 903, 937. "A substantial negative effect of a project on view and other features of beauty could constitute a significant environmental impact under CEQA." *Ocean View Estates Homeowners Assn., Inc. v. Montecito Water District* (2004) 116 Cal.App.4th 396, 401. As explained by the court in *Quail Botanical Gardens Foundation, Inc. v. City of Encinitas* (1994) 29 Cal.App.4th 1597, 1606, it is "self-evident" that replacing open space with development will have an adverse effect upon "views and the beauty of the setting."

A6-07

The DEIR does not comply with CEQA's requirements for considering a project's aesthetic impacts. It fails to fully consider the environmental setting surrounding the Property, and thus is unable to adequately analyze the Project's aesthetic impacts. When properly considered, it is apparent that the Project will have significant aesthetic impacts on users of the Land Trust's Dunn-Wildlake Preserve. The DEIR must evaluate, and if possible, require mitigation or avoidance of these impacts.

1. The DEIR Does Not Fully Consider the Project's Aesthetic Setting.

At the outset, the DEIR's description of the proposed Project's environmental setting is sparse and legally inadequate. CEQA mandates that an EIR include a description of "the physical environmental conditions in the vicinity of the project . . . from both a local and a regional perspective . . . . Knowledge of the regional setting is critical to the assessment of environmental impacts." CEQA Guidelines § 15125(a), (c).

The DEIR's description of the "regional setting" improperly focuses on vineyards and agricultural activities in Napa County. See DEIR 4.10-1. It does not acknowledge that the Project is entirely surrounded by natural habitat within a regionally-significant wildland complex totaling over 12,000 acres. The nearest vineyard on Friesen Drive is roughly a mile away, immediately outside of the community of Angwin. A ridge separates the Property from the other closest vineyard to the east.

The DEIR also incorrectly suggests that hunting activities occur in the Project area. It continually references a "hunting lodge" located on the Land Trust's Preserve, immediately adjacent to the Property. DEIR 2-4, 4.1-1 through 4.1-2, 4.1-6, 4.10-1. Yet the DEIR never acknowledges that this cabin has not been used for hunting (or any other activity) since the Land Trust acquired the surrounding land. A6-08

Importantly, Friesen Drive is the primary access to the Land Trust's Dunn-Wildlake Preserve, which directly borders both the east and west sides of the Property. The 3,030-acre Preserve contains a complex mosaic of several forest, scrub and grassland plant communities, and a diverse suite of wildlife species that rely on those habitats. Further, the preserve neighbors a number of other protected conservation areas managed by California State Parks, the Bureau of Land Management, the California State Land Commission, the Land Trust, and the Biological Field Studies Association. *See* Attachment 4. In total, these lands comprise a 12,000 plus-acre, regionally significant wildland complex. This area was targeted for protection because it contains some of the highest plant and animal diversity in Napa County, which itself lies at the core of a recognized global biodiversity hotspot referred to as the "California Floristic Province." *See* Attachment 5; Attachment 6 (describing the area near Angwin as one of the "richest hotspots of global rarity"). Napa County has also been recognized as having a high natural level of biodiversity compared to California as a whole. *Atlas of the Biodiversity of California*, California Department of Fish and Wildlife, Monica Parisi, Editor (2003).

In fact, the high biological resource values in this area drove the acquisition and subsequent protection of the Preserve, which was funded by private foundations, public entities, and Napa County residents including Randy and Lori Dunn, the California

Wildlife Conservation Board, the California State Coastal Conservancy, the California Department of Fish and Wildlife, the Gordon Moore Foundation, and the David and Lucile Packard Foundation. In addition to its significant natural values, the Preserve is used for recreational hiking, environmental education and scientific research because of its outstanding natural resources. *See* Attachment 7. To properly consider the Project's aesthetic and other environmental impacts, the DEIR must acknowledge that the Property is located directly within this large wildland complex. The dominant character of this area is not vineyard or agricultural production as the DEIR suggests. It is conservation of valuable ecosystems. A6-08 (Cont.)

2. The Project Will Significantly Impact the Aesthetic Experience of Visitors to Dunn-Wildlake Preserve.

In addition to ignoring the larger setting surrounding the Property, the DEIR does not consider the aesthetic impacts that constructing and operating the Project will have on visitors to the Dunn-Wildlake Preserve. Most visitors to the Preserve arrive on Friesen Drive, which passes through undeveloped Land Trust property before reaching the Project Property and then the Preserve entrance. *See* THP at 89, 104; Attachment 8 at 3, 8. The proposed Block A is directly adjacent to and visible from the entrance to the Preserve. *See* Attachment 8 at 5 (view of area proposed for Block A from entrance to Dunn-Wildlake). The Property is also visible from public trails over Three Peaks on the Preserve property. *See id.* at 1. And Block C of the proposed vineyards is located in close proximity to a new hiking trail that the Land Trust has designed and will begin constructing in Spring 2016. *See* Attachment 9 (location of trails near the property). The applicant has not proposed any setback of the Project's footprint from either Friesen Drive or the Land Trust's property. *See* THP 14. A6-09

As these maps and photographs indicate, the only view of the Property is currently undeveloped woodland and other open space, which is consistent with the wilderness experience sought by visitors to the Preserve. But construction of the Project, which could take multiple years before vineyard operations even begin (TCP 10), will impair the area's aesthetic character and the experience of Preserve visitors. The DEIR must consider the aesthetic impact that the Project, and its construction equipment, earthwork, and tree cutting, would have on the existing visual character of the site and its surroundings.

Even vineyard operations would be incompatible with the existing visual character of this area. Newly-planted vineyards appear as bare earth with little accompanying vegetation and are inconsistent with the existing wild character of the site. *See* Attachment 10. Once established, vineyards often use reflective bird control ribbon, which creates glare in the sunlight and would further detract from the natural scenery. *See*

Attachment 11 at 3.11-12. The DEIR must disclose whether the applicants will use reflective ribbon on the Property, and if so, evaluate the impacts this activity would have on the area's visual character. Even if applicants will not use reflective ribbon or other visual distraction to control birds, a developed vineyard adjacent to a wildlife preserve where visitors seek a wilderness experience creates significant visual impacts.

Finally, the DEIR cannot conclude that the Project will not have light and glare impacts until it discloses whether nighttime operations will occur as part of the Project. Nighttime and early-morning harvests are very common in the County's grape industry. *See* Attachment 11 at 3.11-10 through 3.11-12; Attachment 12. But the DEIR does not disclose whether such activity will be allowed or prohibited on the Property. If the Project follows this industry norm, the DEIR must disclose and analyze these potential impacts and provide all necessary mitigation. A6-09 (Cont.)

B. The DEIR's Analysis and Mitigation of Impacts to Biological Resources Is Inadequate.

1. The DEIR Omits Discussion of Species Observed or Potentially Occurring at the Project Site.

CEQA and the Forest Practices Act require environmental impact reports to identify the existing habitat on a project site and the potential for species to occur in that habitat. *See* CEQA Guidelines, Appendix G, IV. Here the DEIR fails to consider special-status species that have been observed on the Property or have the potential to occur there. By failing to acknowledge these species, the DEIR fails to analyze the Project's potential impact to them. A6-10

For instance, the DEIR does not account for two rare plant species that have been observed by Land Trust staff and consultants within the Property from locations along Friesen Drive. In each of the past three years, Land Trust staff has observed Nodding harmonia (*Harmony nutans*) on volcanic ash outcrops in Block C from Friesen Drive. Nodding harmonia has a highly restricted distribution (limited to portions of Sonoma, Lake and Napa Counties) and is included in the CNPS Inventory of Rare and Endangered Plants on list 4.3. In 2007 and 2008, botanist Jake Ruygt also observed Tall snapdragon (*Antirrhinum virga*) on the Property. Attachment 2. This species is limited to the southern portion of the north coast ranges and is also included in the CNPS Inventory of Rare and Endangered Plants on list 4.3.

The forest in the proposed vineyard Block C also provides nesting habitat for numerous migratory birds protected under the Migratory Bird Treaty Act. During the breeding season, Land Trust staff has observed several migratory bird species utilizing A6-11

the coniferous forest stands slated for removal to create vineyard block C. These birds include western tanager, black-throated gray warbler, orange-crowned warbler, Audubon's warbler, Cassin's vireo, warbling vireo, Pacific slope flycatcher, blue-gray gnatcatcher, and black-headed grosbeak. Developing the proposed Project could cause the loss of substantial populations of these species, but because the DEIR does not recognize their presence, it fails to consider this potential impact. A6-11 (Cont.)

The DEIR also fails to consider a number of special status species that have been documented within 10 miles of the Property and have the potential to occur at this site. These species exist in analogous habitats to that found on the Property: *Brodiaea leptandra Erigeron bioletti, Erigeron greenei, Eriogonum umbellatum var. bahiaforme, Juglans hindsii, Layia septentrionalis, Leptosiphon jepsonii, Leptosiphon latisectus, Monardella viridis, Tritelia lugens*. *See* Attachment 2. A6-12

Some of these species were likely missed during biological resources surveys of the Property because surveys did not extend into the months that these species would bloom in this location. *Id.* Without adequate surveying techniques, the DEIR must assume that these species occur onsite and evaluate the Project's impacts to them. CAL FIRE must then consider impacts to these species and adopt all feasible mitigation or alternatives necessary to reduce or avoid those impacts.

2. The DEIR Does Not Properly Analyze and Mitigate Impacts to Native Habitat and Identified Special-Status Species.

The DEIR's discussion of biological resources does not fully consider how constructing and operating the Project will impact native habitat or identified special status species. The DEIR lacks any meaningful discussion of how Project activities might impact the ecosystem within and surrounding the Property. For instance, the Property contains numerous rocky outcroppings and thin soil layers in many portions of the proposed vineyard sites. *See* DEIR, Appendix O. Thus, construction of the vineyards will require ripping of volcanic rock and possibly blasting. DEIR 3-11 through 3.12. This process would permanently alter the substrate and likely prevent many native species from occupying the vineyard sites again. The DEIR fails to analyze the irrevocable biological impacts of these Project activities. A6-13

The use of pesticides and insecticides, introduction of invasive species, and lights and noise (including rock blasting and milling trees onsite) from the Project, all have the ability to impact species within the immediate vicinity of the Property. Currently, plant communities within Wildlake-Duff complex are dominated by native plants, and the Land Trust has been utilizing early detection-rapid response methods to prevent the establishment and dispersal of new invasive species within this highly diverse and intact

wildland complex. The proliferation of invasive exotic species is widely acknowledged to be the second leading cause of loss of biological diversity globally, following only habitat loss and fragmentation. Invasive species can outcompete and displace native species, disrupt ecological function, reduce biodiversity levels and degrade wildlife habitat. *See* Attachment 13; *see also* Allendorf and Lundquist (2003), Introduction: *Population Biology, Evolution, and Control of Invasive Species. Conservation Biology*, 17: 24–30.

The proposed Project will result in substantial soil disturbance, increased human activity, and increased use of equipment transported from other areas. In doing so, it will likely introduce and spread invasive exotic plant species into the adjacent Wildlake-Duff wildland complex. *See* Attachment 2. Disturbed sites associated with other vineyard development along Friesen Drive are dominated by yellow starthistle, Harding grass, and many other highly invasive species. An increase in foot, vehicle, and equipment traffic associated with the proposed vineyard construction and operations will substantially increase the risk of introduction and spread of these species, as well as soil-borne plant pathogens such as *Phytophthora cinnamomi* and *Phytophthora ramorum*. A6-13 (Cont.)

In fact, the vineyard's proposed pest management program actually anticipates bringing non-native species to the Property. *See* DEIR, Appendix J (the Project's pest management program involves releasing predatory mites and "beneficial wasps" on the Property). The applicants have also indicated that they will use cover crops onsite, including barley, rye grass, vetch, pea, clover, native grass, fawn tall fescue. DEIR 3-11; TCP 12. It is impossible to know whether these cover crops are invasive because the Project documents do not provide scientific names for these crops. Based on their common names, some of these cover crops may be on lists of known invasive species.[2] Like other potential impacts associated with developing on the edge of valuable habitat (known as "edge effects"), the DEIR never considers the impact that such invasive species will have on biological resources in the area, including identified special-status species. Without such an analysis, the DEIR cannot conclude that impacts to these resources will be less-than-significant.

Furthermore, the DEIR fails to adequately analyze the environmental impacts the Project will have on the following special status species:

a. Western Pond Turtle

The DEIR acknowledges that "the property provides habitat for . . . western pond turtle" (DEIR 6-7), and that at least one pond turtle has been identified near the reservoir on the Property (DEIR 4.4-52). Populations of the western pond turtle have faced steep A6-14

[2] *See* http://www.cal-ipc.org/paf/

declines throughout the west coast, including in California. *See* Attachment 14. The U.S. Fish and Wildlife Service is currently considering a petition to list the western pond turtle as endangered. *Id.*[3] Recent studies also show that the previously identified western pond turtle is in fact two separate species, each with much more limited natural ranges. *See id.* (The DEIR incorrectly describes the pond turtle's range as extending from Washington state to Baja California. DEIR 4.4-32.)

Despite the significantly threatened status, the DEIR asserts, without any evidence, that western pond turtles would not use portions of the Property slated for development. In fact, the conclusion that pond turtles would not travel to other areas of the Property, including the proposed vineyard blocks and the oak tree enhancement areas, is contradicted by existing literature on this species. Studies have found that the pond turtle spends substantial time in terrestrial habitats and can forage and nest hundreds of meters from the water.[4] Additionally, substantial habitat degradation, including tree cutting, will occur in the enhancement areas directly adjacent to the reservoir where the pond turtle was observed. *See* DEIR Figure 4.4-3; Section II.B.2, *infra*. A6-14 (Cont.)

Additionally, even if pond turtles did not visit sites of active Project construction and operation, the DEIR contains no analysis of whether noise, dust, nighttime lighting, or foreseeable edge effects associated with the Project would impact the viability of turtle's presence in the area. The DEIR failure to consider these impacts on the western pond turtle violates CEQA.

b. Northern Spotted Owl

The DEIR acknowledges that the Project site contains habitat for the Northern Spotted Owl and that these owls have been observed within a mile of the site. DEIR 4.4-49. The Project will destroy this onsite habitat, but the DEIR never evaluates what the cumulative impact of this habitat destruction would be on the Northern Spotted Owl. Additionally, this destroyed owl habitat makes up the northern tip of 11 acres of habitat that lies just south of the Property. Attachment 15 (excerpt from DEIR, Appendix O). The DEIR must consider how construction and vineyard activities situated on the edge of this remaining habitat could impact visiting owls. A6-15

[3] *See also* https://www.federalregister.gov/articles/2015/04/10/2015-07837/endangered-and-threatened-wildlife-and-plants-90-day-findings-on-10-petitions

[4] *See* Petition to List 53 Amphibians and Reptiles as Threatened or Endangered Under the Endangered Species Act at p. 89 (available at http://www.fws.gov/southeast/candidateconservation/pdf/Petition_53AmphibiansReptiles.pdf)

c. Migratory Birds and Bats

Conversion of forested areas within the proposed vineyard blocks will result in loss of breeding habitat for several migratory bird species protected under the Migratory Bird Treaty Act. As mentioned, Land Trust staff have observed numerous migratory birds within the Project area.

The DEIR's proposed mitigation for impacts to special status birds nesting on the Project site states the Department of Fish and Wildlife ("CDFW") recommends that the site be surveyed no sooner than 14 days prior to Project activity during nesting season. DEIR 2-9, 4.4-50. The DEIR must go further than simply stating that CDFW recommends this proposed surveying mitigation; it must actually require surveying. It must also ensure that all surveying occurs during the nesting and breeding season. Additionally, most birds are most active during early morning hours, so surveying will be less effective if it occurs during other times of the day. The mitigation measure should specify monitoring to include all times of the day, including nighttime for certain owl species. Cavity nesters, such as Purple martins, are particularly difficult to locate, and to be effective, surveying must specifically target these species.

A6-16

The Biological Resource Report states that trees on the site have the potential to support raptor use, but incorrectly states that the proximity to Friesen Drive may deter raptors from using the site. DEIR Appendix D at D-6. At current use levels, this one-lane unpaved road, surrounded by intact native habitat, is not a deterrent to nesting raptors. Land Trust staff have observed a number of raptor species in the area surrounding Friesen Drive, including red-shouldered hawk, red-tailed hawk, sharp-shinned hawk, Cooper's hawk, peregrine falcon, American kestrel, bald eagle, and osprey. Staff have observed osprey nests directly adjacent to Friesen Drive. Land Trust staff have likewise observed northern pygmy owls, western screech owls, barn owls, and western screech owls in the area of the Project.

Noise, dust, and loss of foraging and nesting habitat stemming from this Project will significantly impact raptors and owls. In order to determine appropriate mitigation, the DEIR must conduct and describe the results of a detailed survey of birds found on the Property and then ensure that the protocol for the required pre-construction surveys will effectively identify whether birds are nesting on the Project site. The DEIR must also consider the impact that Project operations and permanent habitat loss will have on these raptor and owl species.

Finally, the analysis of and proposed mitigation for impacts to bat species is inadequate. First, the DEIR discusses only potential construction-related impacts to bats on the Property. It must also consider the potential impacts of vineyard operations on

A6-17

bats. Also, monitoring begins only 3 days before the start of construction at the earliest. This likely provides an inadequate lead time to halt construction if bats are detected on site. A6-17 (Cont.)

3. The DEIR's Analysis and Mitigation of Impacts to Oak Woodlands Is Inadequate.

Napa County's hillside oak woodlands have "come under increasing pressure from vineyard conversions."[5] The County has projected that from 2005 to 2030, between 2,682 and 3,065 acres of additional woodlands will be lost to vineyard development alone.[6] The proposed Project will cut over 5.3 acres of oak woodlands, which comprise roughly 62% of the oak woodland on the Property. DEIR 4.4-43. While the DEIR acknowledges that this cutting would contravene County policies for preserving oak woodlands and would be a significant impact, it asserts that Mitigation Measure 4.4-1 would reduce this impact to less than significant levels. The DEIR claims to mitigate this impact by preserving oaks in a "Habitat Retention Area" and replacing the removed woodlands at a 2:1 ratio, but this mitigation measure is significantly flawed.

Initially, the proposed "Habitat Retention Area" (roughly 3.5 acres) would not actually preserve oak woodland in this area. While this mitigation measure sets some standards to limit construction-related impacts in the retention areas, it does not require any assurance from the applicants that oak woodland will be permanently protected on the Property. *See* DEIR 4.4-46. Such binding obligations are necessary to comply with CEQA's requirement that mitigation measures are enforceable and actually implemented, not simply adopted and ignored. CEQA Guidelines § 15126.4(a)(2); *Anderson First Coalition v. City of Anderson* (2005) 130 Cal.App.4th 1173, 1186. Without permanent protection of the oak woodlands in the retention areas, the applicants (or a future property owner) could undermine this mitigation measure by developing a new project in these areas. The mitigation should include conservation easements or other recorded binding documents ensuring the permanent protection of oak woodlands. A6-18

Moreover, the DEIR proposes 9.6 acres of oak "enhancement" on the Property to mitigate oak woodland loss. Yet the DEIR does not define adequately the scope of this proposed oak enhancement mitigation. It states that 9.6 acres of the Property will be

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[5] *See* Napa County Voluntary Oak Woodland Management Plan at 13 (http://www.countyofnapa.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=4294973990)

[6] *See id.* at 34-35.

enhanced "[a]t a minimum." DEIR 4.4-46. It is entirely possible that this enhancement activity could extend to other locations on the Property that are undisclosed in the DEIR.

The uncertain scope of the enhancement activity is exacerbated by the fact that it is improper for the DEIR to rely on this activity as mitigation. The DEIR's "enhancement" involves removing existing foothill pine and chaparral in the designated enhancement areas and attempting to convert them into oak habitat. DEIR 4.4-46. The DEIR presents no evidence that these enhancement activities could successfully result in new viable oak habitat. In the Land Trust's experience, disturbing and removing naturally-occurring components of a native plant community for oak tree enhancement is not an effective mitigation solution. This proposal also raises questions of who will monitor the oak trees in the enhancement areas, what this monitoring will entail, and what mitigation the applicants will undertake if the proposed "enhancement" fails. A6-18 (Cont.)

The DEIR also overlooks the environmental impacts that could result from the pine and chaparral cutting in the oak "enhancement" areas. CEQA requires that an EIR consider significant impacts that could result from implementing a mitigation measure. CEQA Guidelines § 15126.4(a)(1)(D). But the DEIR neither describes the amount of cutting expected to occur in the enhancement areas, nor considers the impact that this tree cutting will have on the existing ecosystem in these locations. Indeed, this activity conflicts with Napa County General Plan Policy CON-24, which focuses on "retain[ing], to the maximum extent feasible, existing oak woodland *and* chaparral communities." DEIR 4.4-10 (emphasis added). It is likewise inconsistent with General Plan Goals CON-2 (requiring maintenance and enhancement of existing level of biodiversity) and Con-4 (require conservation and protection of native plants and wildlife). A6-19

Land Trust staff expects that these "enhancement" activities will reduce the structural and compositional complexity of the habitat, and alter the naturally-occurring plant community in the enhancement areas. Removing Foothill Pines and chaparral species also reduces cover and foraging habitat for fauna that use the Project site. Attachment 2. Without considering these impacts, the DEIR improperly elevates new oak habitat over existing chaparral and pines on the Property, effectively sacrificing these communities in the name of oak "enhancement" mitigation.

Finally, it is unlikely that the proposed enhancement areas can be use legally to mitigate the loss of oak woodlands. First, Napa County's Conservation Regulations prohibit "vegetation removal associated with the development or use of land [on parcels] having a slope of thirty percent or greater." Napa County Code § 18.108.060.[7] The bulk A6-20

[7] The ordinance contains limited exceptions and exemptions that do not apply to this Project.

of the oak enhancement areas occur on the steepest portions of the parcel, which contain thirty percent or greater slopes. *Compare* DEIR Figure 4.4-3 (oak retention areas) *with* Attachment 3 (excerpt from DEIR's soil analysis). Consequently, trees, chaparral, and other vegetation cannot be legally removed from these locations on the Property.

Second, the Property is currently encumbered by an easement that largely prohibits development and other activities on the eastern portion of the Property, which includes the oak tree mitigation areas. *See* Attachment 16 (easement stating that "No use shall be made" of the encumbered property). Thus, the easement already protects this area from development. In effect, the DEIR is claiming mitigation credit for land that is already preserved. To provide effective mitigation, the DEIR must preserve or restore land that is not already protected from development. A6-20 (Cont.)

4. The DEIR Does Not Properly Analyze Compliance with County Canopy-Preservation Standards.

Despite the DEIR's contrary assertion (DEIR 4.4-44), the proposed Project does not appear to comply with Napa County's ordinance requiring preservation of 60% of the tree canopy (as indicated on a June 1993 County map) on parcels within the drainage of Bell Canyon Reservoir. *See* County Code § 18.108.27. While the DEIR acknowledges that the Project must comply with this ordinance (DEIR 4.4-44), it does not calculate the area of tree canopy that will be cut to develop the proposed vineyard blocks or compare that canopy loss to mapped conditions of the Property. The DEIR also does not consider the additional canopy lost from cutting foothill pines or other trees as part of the oak "enhancement" activities. Without such analysis in the DEIR, the public and decisionmakers cannot determine whether the Project complies with the County's 60% canopy preservation requirement. Thus CEQA requires the DEIR to actually calculate the amount of canopy that the Project will remove and compare that to the canopy standards in the County's ordinance. CEQA Guidelines § 15064(b) (significance determinations must reflect "careful judgment . . . based to the extent possible on scientific and factual data."). A6-21

For projects that will clear vegetation on two contiguous parcels (like the proposed vineyard), the County's ordinance also requires that:

> (1) the total vegetation proposed for clearing would not be greater than what could be cleared if each contiguous parcel was treated as an individual unit;
>
> (2) a report prepared by a qualified biologist is submitted to the director which concludes that the proposed vegetation

> clearing would not result in greater impacts to biological resources than what would occur if the combined parcels were treated as individual units; and
>
> (3) a memorandum of understanding or similar document in a form acceptable to county counsel is recorded for each parcel describing the amount of vegetation to be retained on each of the parcels.

A6-21 (Cont.)

County Code § 18.108.27(B). The DEIR must also analyze the Project's consistency with these additional requirements. *See* CEQA Guidelines, Appendix G, X (requiring an EIR to evaluate compliance with applicable ordinances). Without such information, the DEIR cannot conclude whether the Project complies with the terms of the County's canopy-protection ordinance.

5. The DEIR's Description of Forest Alliances on the Project Site Is Inaccurate.

A6-22

The DEIR's Biological Resources Report underestimates the percent canopy cover of ponderosa pine within the proposed Block C. Ponderosa pine is co-dominant to dominant in the forest overstory in relation to Douglas fir in this area, and should be delineated as Ponderosa Pine Forest Alliance rather than Douglas Fire Forest Alliance. *See* DEIR Figure 4.4-1. The Mixed Oak Alliance also contains Ponderosa Pine that the DEIR does not acknowledge. Attachment 2. Further, Block C constitutes a portion of a larger ponderosa pine-dominated coniferous forest area that extends well into the Dunn-Wildlake Preserve. *See* Attachment 8 at 4. Ponderosa pine forests are considered sensitive biotic communities because they are rare within Napa County[8] (less than 170 acres, or 0.03% of the County) and occur at the edge of their regional distribution here. Ponderosa pine forests in the County are concentrated in the Angwin/Howell Mountain area. The proposed vineyard conversion on Block C would result in the loss of 64% of this biologically important and locally rare plant community type within the Project area. But the DEIR does not adequately account for the impact that vineyard conversion will have on the Ponderosa pine.

6. The DEIR Does Not Properly Analyze and Mitigate Impacts to Reservoirs and Streams.

A6-23

The EIR acknowledges that waters of the United States exist on the Property. These streams, as well as the onsite reservoir, could all be impacted by erosion, sediment

[8] *See* http://www.napawatersheds.org/app_pages/view/198

discharge, logging, fuel or oil spills, and discharges of herbicides, pesticides, and nutrients associated with vineyard operations. DEIR 4.4-47. The EIR concludes that the Project will not impact the onsite reservoir because it "is outside of the project footprint and is upstream of proposed vineyard development activities." *Id.* But again, the EIR does not consider the whole of the Project that could potentially impact this water body. Most notably, two oak "enhancement" areas directly abut the reservoir as well as a stream on the south of the Property. *See* THP at 72. The DEIR must consider how these "enhancement" activities, including significant vegetation removal, could cause sediment, fuel, or other discharges that would impact these water bodies.

Moreover, the DEIR assumes that setbacks from the onsite streams will protect these watercourses from impacts. Yet the DEIR offers no analysis of how these setbacks are sufficient to prevent sediment, fuel, oil, herbicides, pesticides, and nutrients from entering the streams. Instead, the DEIR relies on Mitigation Measures 4.8-1 and 4.8-2 to further reduce these runoff-related impacts, but those mitigation measures only pertain to fuel spills from construction equipment (Measure 4.8-1) and pesticide use in vineyards (Measure 4.8-2). They lack requirements that would protect against sediment, fuel, oil, and other chemical and nutrient runoff during vineyard operations. The DEIR cannot simply assume that the proposed setbacks would sufficiently protect streams from such discharges. Instead, it must support this assumption with facts and analysis. A6-23 (Cont.)

Runoff from the Property could also reach streams, wetlands, and the reservoir on the Dunn-Wildlake Preserve. This runoff could cause algae blooms and have other impacts to these water bodies. Attachment 2. The DEIR must assess these potential impacts as well.

7. The DEIR Does Not Properly Analyze the Project's Impacts to Wildlife Corridors.

Again, the DEIR does not properly describe the Project setting or analyze Project impacts to wildlife corridors and movement of species. First, while it determines that interference with wildlife movement would, by itself, constitute a significant impact (DEIR 4.4-42) and acknowledges that the Project will impair wildlife movement (DEIR 4.4-23), the DEIR fails to analyze whether this impact will be significant. Aside from a single barbed-wire fence across the Property's western border, this site has no current impediments to wildlife movement. DEIR 3-13. Mammalian wildlife documented using the area immediately surrounding the Property include the black bear, bobcat, puma, gray fox, coyote, striped skunk, black-tailed deer, black-tailed jackrabbit, Sonoma chipmunk, dusky-footed woodrat, and gray squirrel. *See, e.g.,* Attachment 8 at 6. Establishment of fenced vineyards and cattle guards throughout the Property, as well as the associated A6-24

construction and operation activities, and overall increase in human activity, would impair and deter wildlife movement across the Project site.

The DEIR improperly ignores this potential impact, and instead limits its focus to the presence of wildlife corridors. It asserts that: "Biological surveys of the property concluded that no identifiable significant wildlife corridors are associated with the property or project site." DEIR 4.4-54. In fact, the Property is contained within a large wildlife linkage system. The collaborative, science-based "Critical Linkages: Bay Area and Beyond" project has identified the area encompassing the Project site as a key part of the Blue Ridge to Marin Coast critical linkage.[9] *See also* Attachment 17. Further, the science-based Conservation Lands Network's conservation prioritization analyses identify the Property as an area "Essential to [regional] Conservation Goals," and shows that it is entirely surrounded by protected open space and other "essential" conservation areas. *See* Attachment 18.[10] And in its evaluation of potential Project alternatives, even the DEIR acknowledges that critical wildlife corridors exist on the Property: "Impacts to the onsite wildlife movement corridors and habitat would be temporarily impacted during the operation of the timber harvest and replanting activities." DEIR 5-7. A6-24 (Cont.)

These existing wildlife corridors make the Project's use of wildlife-exclusion fencing and cattle guards around the proposed vineyard blocks especially problematic. These Project features would block most wildlife movement through the Property. The Land Trust also anticipates that the Project's increased daily traffic on Friesen Drive, along with near-continuous equipment and human activity within the vineyard blocks will deter wildlife from using that area as well. The DEIR must acknowledge these impacts and discuss available methods to mitigate or avoid them.

C. The DEIR's Analysis of Impacts to Forestry Resources Is Inadequate.

The DEIR establishes a threshold of significance for loss of forest land caused by the Project, but then overlooks the established threshold when analyzing the Project's impacts. Specifically, the DEIR acknowledges that the Project will have a significant forestry impact if it results "in the loss of forest land or conversion of forest land to non-forest use." DEIR 4.2-6. As the DEIR acknowledges, one of the Project's core objectives A6-25

[9] Penrod, K., et al. Critical Linkages: Bay Area & Beyond at 153, 156-61 (available at http://www.scwildlands.org/reports/CriticalLinkages_BayAreaAndBeyond.pdf)

[10] The explorer tool allows identification of critical wildlife linkages in Bay Area counties (http://www.bayarealands.org/)

is to "[c]onvert the 13.6 acre project site," including over 10 acres of timberland, "to permanent uses other than timberland." DEIR 3-6. But while this forest-to-vineyard conversion is a significant impact under the plain terms of the DEIR's significance threshold, the DEIR concludes that no significant impact will occur. DEIR 4.2-7.

The DEIR offers no evidence to support its conclusion that the Project's supposedly "limited size" will avoid a significant impact from forest loss. This conclusion is contrary to the plain terms of the established significance threshold, which does not contain an exemption for projects that will convert 13.6 acres or less of forest. The DEIR must apply the letter of this significance threshold and determine the Project's impact on Forestry Resources is significant. A6-25 (Cont.)

Even if the project's supposedly "limited size" could legally justify a finding of no significant impact, the DEIR does not properly consider the Project's cumulative impacts to forest loss. For instance, other information submitted to CAL FIRE states that many other vineyards in the County have been established by cutting forested areas that are the same or similar to the Property. TCP 10. And the nearby Town of Angwin has itself expanded into forested wildlands. TCP 19. Consequently, the DEIR must consider the cumulative impact of this forest loss, as well as forest loss from the recent wildfires in northern Napa County.

D. The DEIR's Analysis of the Fire Hazards Is Inadequate.

CEQA requires agencies to consider impacts that could result from exposing people to hazardous conditions at a Project site, including risks associated with wildfires. CEQA Guidelines, Appendix G § VIII(h). An EIR must describe the physical conditions in the vicinity of the project from both a local and a regional perspective.

Here, the DEIR omits the critical information required to understand the severity and extent of the wildfire risk that would occur upon implementation of the proposed Project. While the DEIR acknowledges that the entire Property is located on land that CAL FIRE has designated as a "Very High Fire Hazard Severity Zone" (DEIR 4.8-2), it ends its discussion of the environmental setting for fire hazards there. The DEIR does not consider how climate change and California's extreme drought have magnified fire risks throughout the state, including in Napa County. A6-26

At a minimum, the DEIR should have addressed the following questions pertaining to the area's recent wildfire history:

- How many people and homes are there in the vicinity of the Project site?

- What percentage of the lands in Napa County (i.e., existing forests) that historically experienced frequent but low-intensity surface fires, are now predisposed to high-intensity, high-severity crown fires (for example, because of the greater infrequency of fires due to fire suppression efforts)?

- What exactly is the County's rank in CAL FIRE's list of "Wildfire Activity Statistics"?

- How many major wildland fires have occurred in the area within the last decade? How many structures were lost? How many acres of land were consumed?

- Was there adequate fire response for these wildland fire events? Were additional fire fighters recruited from across or outside the State? What was the standard response time for wildland events? Was there sufficient water to fight the wildland fires?

- Which locations within the wildland areas are considered to have inadequate access and evacuation options? Inadequate access (e.g. long roads with a single access point, roads over steep grades, improper road surfaces, and/or narrow roads) significantly contributes to the inability to effectively evacuate residents during a disaster and provide necessary emergency access for fire, ambulance, or law enforcement personnel?

A6-26 (Cont.)

These are just a few of the issues that the DEIR should consider to properly evaluate the severity of the fire risk associated with the proposed Project. Indeed, two large wildfires have burned over 110,000 acres of forest in southern Lake and northern Napa Counties during the past two months.[11] Another nearby fire, the Rocky Fire, burned an additional 70,000 acres.[12] The most severe of these fires, the Valley Fire, burned over 76,000 acres and has been identified as one of the most destructive fires in the history of the state. Attachment 19. That fire, which came within 4 miles of the Property, grew rapidly overnight and stretched existing emergency resources in the area. Attachment 20. The existing local road network would be easily overwhelmed during an evacuation, hindering vineyard workers' ability to evacuate the Project area. Attachment 21. Without

[11] See http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=1226 (Valley Fire); http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=1193 (Jerusalem Fire).

[12] http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=1161

a complete assessment of the severe fire risk that lead to the catastrophic Valley Fire, the DEIR cannot adequately consider the Project's impacts from increasing or exposing people, including Project workers, to fire risks. A6-26 (Cont.)

Moreover, the DEIR appears to understate the fire hazards associated with Project construction. It assumes that construction-related fire risks (including sparks from machinery and power tools) will be mitigated by implementation of requirements of Public Resources Code sections 4427 and 4428, and Article 8 of the Forest Practices Rules. But the DEIR never evaluates whether these standards are sufficient to minimize all the Project activities related to timber harvest, preparation of the site for vineyards, installation of the ECP, and other activities. Most significantly, the DEIR reveals that the Project includes burning that could occur as part of timber harvest activities, and blasting to prepare the site for vineyards. *See, e.g.,* DEIR 3-9 ("All non-merchantable trees and vegetation will be chipped and/or burned onsite . . ."); 3-12 ("blasting may also be used to clear some rock areas"). These activities will "occur during the first half of the dry season" and can significantly exacerbate the fire risk associated with constructing the Project. DEIR 3-14.

The DEIR also does not consider risks associated with operating harvest equipment at the vineyards, or sparks from vehicles transporting workers, equipment, and crops to and from the property. And the DEIR completely overlooks hazards created from bringing vineyard employees regularly to a Very High Fire Hazard Severity Zone. The DEIR acknowledges that up to 10 workers could be employed at the vineyard during harvest season. DEIR 4.3-8. The DEIR must likewise acknowledge and analyze the wildfire risks that such workers would face at the Project site. *See* Attachment 11 at 3.8-27. Only then can it properly evaluate, and if necessary, provide mitigation for fire risks associated with these activities. A6-27

Rather than analyze these risks, the DEIR improperly dismisses potential fire hazards associated with operation of the vineyard by concluding that the Project would "reduce exposure of people or structures to significant risk . . . involving wildland fires. This is a beneficial impact." DEIR 4.8-13 The DEIR bases this statement on its conclusion that timber harvesting and understory cutting would "reduce fire biomass fuel." But the DEIR omits the fact the Property is surrounded in every direction by forest, which also provides biomass that could fuel a wildfire. *See, e.g.,* DEIR Figure 4.6-1. The DEIR therefore lacks evidence to support its "beneficial impact" conclusion: it neither quantifies the amount of biomass that it expects the Project to remove, nor explains how this removal will be sufficient to reduce wildfire hazards for a project in the middle of a forest.

E. The DEIR's Analysis of the Project's Impacts to Hydrology and Water Quality Is Inadequate.

Chemicals used in viticulture can enter ground and surface water and impair water bodies. The proposed vineyard Project will potentially include the use of pesticides, herbicides, and fertilizers. DEIR 4.9-20; *see also* TCP 9 ("The vineyard will require a 'strip spray' herbicide application around the newly planted vines"). Water from the Project will ultimately flow into the Napa River, which "is identified as impaired by nutrient loading." DEIR 4.9-6. The DEIR, however, does not adequately evaluate the potential of these chemicals to impair water quality downstream from the Property. Instead, it simply declares that reduced runoff levels and implementation of the applicants' Integrated Pest Management plan and unidentified mitigation measures in section 4.8 of the DEIR "will ensure there is no risk to chemical loading of the Napa River." DEIR 4.9-20. But the identified Integrated Pest Management Plan *calls for* use of pesticides and herbicides on the vineyards and does not provide any protection from these chemicals entering surface and groundwater after they are applied to the vineyards. Similarly, the mitigation measures in DEIR section 4.8 apply only to the operation of equipment and the storage and disposal of chemicals, not to mitigating chemical impacts after they are applied to the proposed vineyards. *See* 4.8-10 through 4.8-13. And even if it reduced the amount of runoff from the Property, the proposed Project does not eliminate all runoff. Consequently, the DEIR cannot simply assume that chemicals contained in this runoff will not reach, and further impair, the Napa River and other water bodies downstream. Instead, the DEIR must evaluate this possibility, and adopt any additional mitigation necessary to reduce this impact. A6-28

The Project also does not meet Regional Water Quality Control Board requirements for reducing sediment load in the Napa River watershed. The Board targets a 50 percent sediment reduction in the watershed, specifically targeting vineyards as a source of excessive sediment discharges. DEIR 4.9-5. Even after implementation of the ECP, however, the Project would not meet this targeted 50 percent reduction. Instead it will reduce sediment discharges from the Property by only 27 percent. DEIR 4.6-14.

The DEIR's conclusion that the Project "would not substantially deplete groundwater supplies" or otherwise lower the local groundwater table is also unsupported. DEIR 4.9-21. "Water use on the new vineyard is expected to be approximately 6.6 acre feet per annum (afa) during the establishment period and 3.3 afa following establishment of the vineyard." DEIR 4.9-7. But the DEIR incorrectly assumes this water use will not impact available groundwater because it is less than the "allowable groundwater allotment for the property." DEIR 4.9-8. The DEIR contains no evidence showing that allowable groundwater allotments have been calculated to avoid reducing A6-29

the groundwater table under the Property. Without such information, it is impossible to know how the Project's water use will affect available groundwater supplies.

The DEIR also erroneously claims that 12.5 acre feet of rainfall on the Property is expected to percolate into the groundwater table each year, suggesting this will compensate for the water used by the Project. DEIR 4.9-21. This calculation is based on rainfall data *from 1975*. *See* DEIR, Appendix N (relying on average annual rainfall contained in Napa County Flood Control and Water Conservation District Isohyetal Rainfall Map, 1975). This comparison violates CEQA's obligation to use *existing* environmental conditions to assess a project's impacts. *See* CEQA Guidelines§ 15125(a) (the environmental baseline is "physical environmental conditions . . . as they exist at the time the notice of preparation is published"). The DEIR's ancient rainfall baseline is especially problematic because it does not account for four years of extreme drought that California has experienced. This drought has both increased crop's reliance on irrigation, and reduced groundwater levels throughout the state.[13] This groundwater impact analysis must be updated to account for current environmental conditions. A6-29 (Cont.)

Finally, the Erosion Control Plan likely does not fully mitigate the impacts from the changed hydrologic conditions that the Project will create. Even if the plan were adequate to control new sediment and pollutant discharges from the Project, altering hydrologic conditions on the Property can still impair streams and waterbodies downstream. *See* Attachment 22. The DEIR must fully evaluate the how the Project may alter flow conditions on the Property, and the ultimate downstream impacts of those altered conditions. A6-30

F. The DEIR Analysis of the Project's Land Use Impacts Is Inadequate.

CEQA requires that agencies analyze the consistency of a project with applicable local plans, including general plans. *See Napa Citizens for Honest Govt. v. Napa County Bd. of Supervisors* (2001) 91 Cal.App.4th 342, 386-87; CEQA Guidelines Appendix G, § IX(b). Inconsistencies with a general plan or other local plan goals and policies that were enacted to protect the environment are significant impacts in themselves and can also be evidence of other significant impacts. *See id.*; *Pocket Protectors*, 124 Cal.App.4th at 929. A6-31

Although it lists numerous General Plan goals and policies that apply to the proposed Project, the DEIR pays little attention to this impact area. Rather, it assumes the

[13] "Drought impact study: California agriculture faces greatest water loss ever seen" (http://news.ucdavis.edu/search/news_detail.lasso?id=10978)

Project is consistent with the General Plan because "[v]ineyards are considered an allowable agricultural land use under the zoning designations of the project site." DEIR 4.10-6. But the Property's zoning does not supplant CAL FIRE's obligation to consider Project's consistency with other standards in the County's General Plan. If the DEIR performed the required consistency evaluation, it would find that the Project frustrates or directly violates many of the General Plan's applicable goals and policies including the following:

> **Goal CON-2**: Maintain and enhance the existing level of biodiversity.
>
> **Goal CON-3**: Protect the continued presence of special status species, including special status plants, special status wildlife, and their habitats, and comply with all applicable state, federal, or local laws or regulations.
>
> **Goal CON-4**: Conserve, protect, and improve plant, wildlife, and fishery habitats for all native species in Napa County.
>
> **Goal CON-5**: Protect connectivity and continuous habitat areas for wildlife movement.

The Project is squarely inconsistent with these General Plan goals. As discussed, it creates numerous new, significant, and unmitigated impacts for special-status species and wildlife habitat more generally. The Project's destruction of woodland, planting of vineyards, and use of wildlife fencing also encroaches on existing wildlife corridors on the Project site. A6-31 (Cont.)

> **Policy CON-17**: Preserve and protect native grasslands, serpentine grasslands, mixed serpentine chaparral, and other sensitive biotic communities and habitats of limited distribution. The County, in its discretion, shall require mitigation that results in the following standards:
>
> - Prevent removal or disturbance of sensitive natural plant communities that contain special status plant species or provide critical habitat to special status animal species.
> - In other areas, avoid disturbances to or removal of sensitive natural plant communities and mitigate potentially significant impacts where avoidance is infeasible.
> - Promote protection from overgrazing and other destructive activities.
> - Encourage scientific study and require monitoring and active management where biotic communities and habitats of limited distribution or sensitive

natural plant communities are threatened by the spread of invasive nonnative species.

- Require no net loss of sensitive biotic communities and habitats of limited distribution through avoidance, restoration, or replacement where feasible. Where avoidance, restoration, or replacement is not feasible, preserve like habitat at a 2:1 ratio or greater within Napa County to avoid significant cumulative loss of valuable habitats.

A6-31 (Cont.)

As discussed, vineyard construction will cut Ponderosa Pine habitat, which is a sensitive biotic community in Napa County. And the Project will destroy the existing grassland, pine, and chaparral habitats on the Property as part of its oak woodland "enhancement" program. Not only are these impacts unnecessary and unlikely to result in successful mitigation, but the Project offers no mitigation of habitat loss from enhancement activities, much less the 2:1 ratio that the County requires.

> **Goal CC-4**: Identify and preserve Napa County's irreplaceable cultural and historic resources for present and future generations to appreciate and enjoy.

As discussed below, the DEIR does not require avoidance and onsite preservation of cultural resources that have been identified on the Property, including on the vineyard site. *See* Section II.H, *infra*. Without such measures, the Project is inconsistent with the General Plan's goal of preserving cultural resources. This and all of the other inconsistencies are significant impacts under CEQA that must be disclosed.

A6-32

Finally, the DEIR must consider the significant land use compatibility problems that the Project will create. As discussed, the DEIR creates a misleading impression that the Property is surrounded by agricultural uses, when in fact, it is situated within undeveloped and protected wildland complex. The numerous significant biologic, aesthetic, and other impacts that the proposed Project will create demonstrate that the Project is incompatible with surrounding conservation and open space land uses.

G. The DEIR's Noise Impact Analysis Is Inadequate.

The DEIR again does not adequately describe the environmental setting that noise from Project construction and operation will impact. As previously stated, the Property lies within thousands of acres of intact and uninhabited natural habitat, and there is no manmade ambient noise onsite. The main entrance to the Land Trust's Dunn-Wildlake Preserve is immediately adjacent to the Property and the Land Trust often leads guided hikes, visitor orientations, and environmental education activities in this area. Further the adjacent "Wild Lake" pond is easily accessible from the Preserve entrance and trailhead

A6-33

area, and is a focal point for visitors seeking a noise-free, non-consumptive wildland experience. The DEIR's noise analysis does not consider these uses immediately adjacent to the Property, and thus fails to consider how the Project's construction and operation-related noise would impact the experience of people utilizing the Land Trust's property. *See* DEIR 4.11-11 (claiming that the nearest sensitive noise receptor is 1,000 feet south of Block D, while the Preserve entrance is immediately adjacent to Block A).

The DEIR does not describe all potential sources of construction-related noise and vibrations from the Project. Notably, chainsaws will be used to cut trees throughout the Property and rocks may be blasted on site as well. DEIR 2-8, Appendix B. Yet the DEIR does not contain any information about how much noise these activities generate, or how that noise will impact nearby noise receptors at the Preserve.

Nor does the DEIR apply the correct thresholds of significance for determining noise impacts. The DEIR improperly adopts the County noise threshold for residential construction (DEIR 4.11-11 and Table 4.11-12), even though the Project is surrounded by thousands of acres of wildland. The DEIR contains no evidence that noise thresholds for developed residential areas are suitable for development on wildlands. A6-33 (Cont.)

The DEIR improperly assumes that, if the Project's agricultural activities are exempt from the County's noise ordinance and consistent with noise standards in the County's General Plan, the Project will not have operation-related impacts. The County's noise standards and exemptions cannot exempt the DEIR from actually analyzing noise impacts from the Project's operation and comparing those impacts to a threshold of significance as CEQA requires. Indeed, daily operation of the vineyards, along with use of heavy equipment and large trucks during harvest season, will likely cause significant disturbance of the quiet, natural setting that visitors to the Dunn-Wildlake Preserve currently experience. The DEIR cannot ignore these impacts. Instead, it must analyze them and require feasible mitigation.

H. The DEIR's Analysis of Other Impact Areas Is Inadequate.

Review of the DEIR's impact analyses reveals other legal inadequacies:

Cultural Resources – the DEIR acknowledges that known cultural resources already exist on the site of the proposed vineyard, and could be disturbed during vineyard construction. DEIR 4.5-8. CEQA requires public agencies to avoid damaging cultural resources where feasible. CEQA § 21084.2. And CEQA contains and requires EIRs to consider a series of mitigation measures that allow agencies to avoid and preserve cultural resources near project sites. *See* CEQA § 21084.3. But the DEIR never considers these statutory mitigation measures, or discusses the feasibility of avoiding impacts to cultural resources. A6-34

Traffic – the DEIR does not describe existing baseline traffic conditions near the Project site. Instead, it improperly relies on Napa County's "Traffic Volume Summary," which was published over half a decade ago. This document lacks data for most of the roads near the Project site, and contains even older data for others.[14] Without information regarding baseline traffic conditions near the Project site, the DEIR cannot properly analyze the Project's traffic impacts.

The DEIR suggests that construction-related traffic will not have a significant impact because it will occur outside of peak periods. While construction activities will occur between 7 a.m. and 7 p.m. (Monday through Saturday), the DEIR never identifies when peak construction traffic is expected to occur, nor compares those periods to peak traffic times on surrounding roadways. DEIR 4.12-6. Notably, the Traffic Volume Summary indicates that peak traffic periods may fall within the Project's construction window. *See* Attachment 23 (Howell Mountain Road a.m. peak times are 7:30 a.m. and 10:15 a.m. and p.m. peak times are 2:30 p.m. and 3:45 p.m.; White Cottage Road a.m. peak times are 7:45 a.m. and 11:00 a.m. and p.m. peak times are 2:45 p.m. and 5:30 p.m.).[15]

The DEIR also fails to properly consider the impacts of peak grape harvest traffic on peak period traffic for the surrounding roadways. The DEIR dismisses this potential impact because the "long-term addition of operation trips to and from Friesen Drive would be minimal." But peak-time traffic impacts during harvest periods are, by definition, short-term impacts that the DEIR must evaluate. A6-35

Such peak time considerations are especially important because large harvest and construction vehicles will traverse the narrow, and in places, steep Friesen Drive. As Land Trust staff knows, the narrow road contains multiple potential hazards, including limited passing space, blind turns, and sharp drops from the minimal shoulder into adjacent valleys. *See* Attachment 8. In places, the road can accommodate only a single vehicle. Given the potentially dangerous interaction between large harvest trucks, construction vehicles, and other cars on this narrow road, the DEIR must evaluate the potential impacts on traffic safety that the increased Project traffic will create.

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[14] *See* Attachment 23 Buckeye Lane (no data); White Cottage Road (data from August 2007); College Avenue (no data); Howell Mountain Road (data from May 2003) (also available at http://countyofnapa.org/publicworks/documents/).

[15] The DEIR never establishes peak traffic periods for Friesen Drive or other roads near the Project site.

Renewable Energy Analysis – CEQA requires an EIR to include a "*detailed* statement setting forth . . . Mitigation measures proposed to . . . reduce the wasteful, inefficient, and unnecessary consumption of energy." CEQA § 21100(b)(3) (emphasis added); *see also* CEQA Guidelines, Appendix F (listing energy consumption considerations for an EIR to consider). The DEIR claims to rely on Mitigation Measure 4.3-1 to satisfy this requirement, but that measure contains no analysis of measures necessary to reduce energy consumption, much less a detailed analysis. The only applicable standard that measure contains is that equipment idling time should be limited to five minutes during Project construction. The DEIR should similarly discuss idling requirements for equipment used during Project operations, address whether idling times less the five minutes are achievable. Additionally, the DEIR should address whether the Project can use energy-conserving equipment and fuels. A6-36

III. The DEIR's Analysis of Project Alternatives Is Inadequate.

A proper analysis of alternatives is essential to comply with CEQA's mandate that significant environmental damage be avoided or substantially lessened where feasible. CEQA § 21002; CEQA Guidelines §§ 15002(a)(3), 15021(a)(2), 15126(d); *Citizens for Quality Growth v. City of Mount Shasta* (1988) 198 Cal.App.3d 433, 443-45. "Without meaningful analysis of alternatives in the DEIR, neither the courts nor the public can fulfill their proper roles in the CEQA process . . . . [Courts will not] countenance a result that would require blind trust by the public, especially in light of CEQA's fundamental goal that the public be fully informed as to the consequences of action by their public officials." *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 404.[16]

Critically, an EIR must consider a "reasonable *range*" of alternatives "that will foster informed decision-making and public participation." CEQA Guidelines § 15126.6(a) (emphasis added); *Laurel Heights*, 47 Cal.3d at 404 ("An EIR's discussion of alternatives must contain analysis sufficient to allow informed decision-making.") The discussion of alternatives must focus on alternatives to the project or its location that are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly. CEQA Guidelines § 15126.6(b). A6-37

[16] The Forest Practice Act also requires THPs to evaluate feasible project alternatives. 14 C.C.R. § 896. Notably, however, the THP's alternative analysis considers a separate list of alternatives from the DEIR, and ignores the No Timber Conversion Alternative. *See* THP 94-97. It provides no justification for this omission.

The DEIR does not comply with these mandates. First, the DEIR does not consider a reasonable range of alternatives. After presenting CEQA's required "no project" alternative, the DEIR offers only one project-wide alternative (the No Timber Conversion Alternative). It does not consider whether vineyard development in a less environmentally-sensitive location is feasible. Nor does it consider any other alternative that would scale down or modify the proposed Project and reduce or avoid its significant impacts.

A6-37 (Cont.)

At the very least, the DEIR should examine a Project alternative that would eliminate development of Block A and provide a 100-foot setback of timberland conversion and vineyard development from Friesen Drive. Such an alternative would significantly reduce the Project's aesthetic and noise impacts to visitor's to the Land Trust's Dunn-Wildlake Preserve. Moreover, reducing the area of timber harvest and vineyard operations would likewise reduce the Project's numerous construction and operation impacts noted throughout the DEIR and in this letter.

Second, the DEIR does not clearly identify an environmentally superior alternative, as required by CEQA. CEQA Guidelines section 15126.6(e)(2) requires a lead agency to identify an environmentally superior alternative among the alternatives considered. *See also Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 737; *Watsonville Pilots Ass'n v. City of Watsonville* (2010) 183 Cal.App.4th 1059, 1089 (". . .the purpose of an alternatives analysis is to allow the decision-maker to determine whether there is an environmentally superior alternative that will meet most of the project's objectives.")

The DEIR attempts to undertake this analysis, but provides inconsistent conclusions regarding the environmentally superior alternative. After the No Project Alternative, the No Timber Conservation Alternative is environmentally superior to the proposed Project because it would involve no timber harvest and would substantially reduce vineyard development (4 acres instead of 13.6 acres). The DEIR acknowledges as much: "Overall, the No Timber Conversion Alterative would likely result in lesser direct impacts to the environment than the Proposed Project." DEIR 5-10. Yet the DEIR then summarily concludes that the "Proposed Project is the most environmentally superior alternative." *Id.*

A6-38

The DEIR does not attempt to reconcile these inconsistent statements. Instead, it simply assumes that the Project is environmentally superior because it "fully meets project objectives" and would implement "the recommended mitigation measures" contained in the DEIR. *Id.* But neither of these factors suffices to compare the Project's *environmental* impacts to the impacts associated with the proposed alternatives. By providing inconsistent statements regarding the impacts of the proposed Project

compared to its alternatives, the DEIR hinders the ability of decisionmakers and the public to properly evaluate these impacts and choose between alternatives. *Watsonville Pilots Ass'n*, 183 Cal.App.4th at 1089.

Third, the DEIR also fails to provide evidence to support its conclusions regarding the No Timber Conversion Alternative, which would reduce many of the Project's environmental impacts. *See* DEIR 5-9. For instance, the DEIR claims that this alternative would not meet Project objectives, but does not offer evidence to support this conclusion. The DEIR also does not support its conclusion that the No Timber Conversion Alternative would have greater long-term impacts to biological resources compared to the proposed Project. DEIR 5-5. The DEIR acknowledges that this alternative would reduce impacts to special-status bat and bird species because it would not involve significant tree cutting throughout the Property. (Though the DEIR improperly labels impacts creating permanent habitat loss "short term"). But the DEIR suggests that the proposed Project, which would cut 5.3 acres of oak woodlands, would have *fewer* impacts on the oak woodlands. The DEIR relies on the proposed retention and "enhancement" mitigation measure to support this conclusion, even though, as discussed, this measure does not adequately mitigate the Project's foreseeable impacts to oak woodlands. More fundamentally, the DEIR ignores the fact that under the No Timber Conversion Alternative, no oak woodlands would be cut. By effectively avoiding this significant impact to oak woodlands, there would be no significant impact for this alternative to mitigate. The DEIR therefore cannot support its conclusion that the proposed Project is more protective of oak woodlands. A6-38 (Cont.)

Similarly, the DEIR improperly assumes that an ECP for the No Timber Conversion Alternative could not reduce sediment runoff to similar levels as the ECP for the proposed Project.[17] *See* DEIR 5-5. This assumption is based solely on the fact that the proposed Project would cover a larger footprint than this alternative. The DEIR does not explain why the Project footprint dictates how much runoff control an ECP may provide, or why an alternative ECP could not be designed to achieve a similar level of sediment reduction. Without such factual support, the DEIR's comparison of erosion, water quality, and hydrology impacts between the proposed Project and the No Timber Conversion Alternative is inadequate.

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[17] Though the DEIR contains inconsistent statements about how much sediment reduction the ECP will actually achieve. *Compare* DEIR 4.6-14 (claiming 27% reduction) *with* DEIR 4.9-14 (claiming 22.4 % reduction).

IV. The Analysis of Cumulative Impacts Is Inadequate.

CEQA requires an analysis of a project's cumulative impacts. CEQA defines "cumulative impacts" as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." CEQA Guidelines § 15355(a). "[I]ndividual effects may be changes resulting from a single project or a number of separate projects." *Id.* "Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time." CEQA Guidelines § 15355(b). The cumulative impacts concept recognizes that "[t]he full environmental impact of a proposed . . . action cannot be gauged in a vacuum." *Whitman v. Bd. of Supervisors* (1979) 88 Cal.App.3d 397, 408.

The DEIR's analysis of cumulative impacts does not comply with CEQA's requirements. This cumulative impact analysis is initially flawed because it relies on the DEIR's impact determinations, many of which are inadequate. Even if the DEIR had correctly determined that the Project would not have significant and unavoidable impacts, CEQA's requirement for a cumulative impact analysis does not end there. Rather, the DEIR must consider the Project's environmental impacts, even if individually minor, in conjunction with impacts from other projects. *Kings County Farm Bureau,* 221 Cal.App.3d at 721 (focusing solely on a project's incremental impacts "avoids analyzing the severity of the [cumulative impact] problem"). The DEIR violates this requirement, repeatedly concluding that because the Project's environmental impacts are supposedly less-than-significant, no cumulative impact would occur. *See* DEIR 6-3 through 6-12 (discussing cumulative aesthetic, forestry resources, air quality, biological resources, cultural resources, geology and soils, groundwater supply, noise, and traffic impacts). Courts have expressly rejected this approach. *Kings County Farm Bureau*, 221 Cal.App.3d at 721. Without a proper cumulative impact analysis, the DEIR violates CEQA. A6-39

The THP's cumulative impact is similarly flaw. The Forest Practice Act also requires a THP to consider a Project's cumulative impacts. 14 C.C.R. § 895.1; *see also* Board of Forestry Technical Rule Addendum No. 2. Yet the THP pulls heavily from the DEIR's direct impact assessment, providing no analysis of the *cumulative* environmental impacts across numerous impact categories. *See* THP 134-142.

Finally, it was improper to limit the assessment of cumulative impacts to biological resources to a three-mile radius surrounding the Property. Significant timberland and other habitat has been lost throughout Napa County from vineyard conversion projects and more is expected to be lost. Attachment 24. Indeed, the Howell Mountain region alone has seen a significant vineyard incursion into existing wildlands over the past 20 years. Moreover, the recent Valley, Rocky, and Jerusalem fires have

destroyed thousands of acres of forest and chaparral habitat similar to that which occurs on the Property. Yet the DEIR never considers the cumulative impact of the Project's habitat destruction along with habitat loss from wildfires. A6-39 (Cont.)

V. The DEIR Must Be Revised and Recirculated.

The current DEIR cannot properly form the basis of a final EIR. CEQA describes the circumstances that require recirculation of a draft EIR. Such circumstances include: (1) the addition of significant new information to the EIR after public notice is given of the availability of the DEIR but before certification, or (2) the draft EIR is so "fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded." CEQA Guidelines § 15088.5.

Here, both circumstances apply. Decisionmakers and the public cannot assess the Project's impacts, or even its feasibility, through the present DEIR, which contains numerous errors and omissions. Among other fundamental deficiencies, the DEIR repeatedly understates the Project's significant environmental impacts and assumes that unformulated or ill-defined mitigation measures will effectively reduce these impacts. In order to resolve these issues, the lead agency must prepare a revised EIR that would necessarily include substantial new information. That DEIR must then be circulated to the public for review and comment. A6-40

VI. The Timber Conversion Plan Contains False Statements and Must Be Denied.

State law and the Forest Practice Rules require CAL FIRE to deny a timberland conversion permit if the application contains material misrepresentations and false statements. Pub. Res. Code § 4624; 14 C.C.R. § 1106.4(a)(1). Here, the TCP contains materially false assertions that require CAL FIRE to deny this application. As noted above, the applicants' own January 2013 soil report shows that Property contains substantial areas with slopes that exceed 30 percent, as well as slopes in excess of 50 percent. Attachment 3. Grading and developing these slopes would require massive earthwork and would violate Napa County's Conservation Regulations. Napa County Code § 18.108.060. The TCP, which the applicant signed in May 2014, attempts to avoid this issue by falsely stating that the "vineyard site has been selected for slope and topographical conditions that will permit agricultural operations," and that the "slope varies from 8 to 27 percent." TCP 28; *see also* TCP 9 ("Slope percent ranges in gradient generally 0% to 27%"). A6-41

Additionally, like the DEIR, the TCP tries to create the false impression that the Property is surrounded by agricultural uses, instead of conservation areas and forested open space. For instance, the TCP asserts that the "proposed project area is adjacent to

several existing vineyards," (TCP 10) when in fact, there are no vineyards adjacent to the parcels that make up the Property. Similarly, the TCP claims that only the Agricultural Resources element of the County's General Plan applies to the proposed Project (TCP 5), when in fact, the Project must comply with multiple other General Plan standards including the plan's conservation element. Given the applicants' mischaracterizations of the Project and the surrounding land uses, CAL FIRE must deny the proposed TCP.

VII. Conclusion

As discussed, the legal flaws in the proposed TCP require CAL FIRE to deny the application for this Project. Additionally, the DEIR and the THP suffer from numerous CEQA violations that require the documents to be revised and recirculated. On behalf of the Land Trust of Napa County, we respectfully request that the CAL FIRE reevaluate the Project in light of its inconsistencies with County ordinances, the Forest Practice Act, and CEQA. A6-41 (Cont.)

Very truly yours,

SHUTE, MIHALY & WEINBERGER LLP

Tamara S. Galanter
Edward T. Schexnayder

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Attachment 1

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Education

December 2007: M.S., Wildlife Biology, Humboldt State University. Thesis: "The response of Cooper's Hawks to experimental ponderosa pine forest restoration treatments in an Adaptive Management Area"

December 2001: B.A., Environmental Studies, University of California Santa Barbara

Work Experience

Land Stewardship Manager, Land Trust of Napa County (2011-Present)
Directing LTNC land stewardship program, including management of 12 nature preserves totaling over 8,000 acres. Primary responsibilities include: (1) developing and implementing preserve management plans, (2) designing and conducting biological resource inventory and monitoring projects, (3) designing and implementing oak woodland, riparian and grassland restoration projects, including the use of prescribed burning and propagation of native plants, (4) designing and implementing conservation science research projects, (5) developing and implementing integrated invasive species management plans, (6) developing and implementing conservation grazing plans, (7) designing and implementing road restoration and water quality-based erosion control projects, (8) coordinating external academic research, (9) conducting conservation values assessments to inform land protection priorities, (10) creating maps and conducting spatial analyses using ArcGIS, (11) facilitating collaborative conservation partnerships, (12) managing contractors, consultants and conservation crews, (13) coordinating maintenance and repair of preserve equipment, infrastructure, and facilities, (14) developing and implementing public access programs, (15) designing, constructing and maintaining hiking trails, (16) developing and installing interpretative trail signage and maps, (17) leading general natural history and topic-specific outings, and (18) authoring stewardship articles and developing education and outreach materials.

Land Steward, Swan Ecosystem Center, Condon, MT (2008-2011).
Worked with numerous partners including private landowners, loggers, ranchers, land trusts, community groups and federal, state and local agencies on collaborative conservation projects in the Swan River watershed (northwest Montana). Primary responsibilities included: (1) assisted private landowners with design, implementation and monitoring of wetland and forest restoration projects and development of conservation plans, (2) designed migratory bird population and habitat surveys and watershed-scale wetland prioritization analyses, (3) conducted spatial analyses and creating maps using ArcGIS software, (4) developed conservation-based educational materials, field tours, demonstrations and workshops for private landowners and local residents, (5) lead a watershed-based conservation stakeholders committee.

Staff Biologist, Avian Science Center, University of Montana, Missoula, MT (2007).
Conducted data analyses, authored technical reports, and presented research findings for a project investigating the response of bird communities to thinning and burning treatments in old growth forest stands across northwestern Montana. Conducted avian point counts and vegetation surveys as part of field effort.

Master's Thesis, Wildlife Department, Humboldt State University, Arcata, CA (2004-2007).
Investigated patterns of foraging habitat selection by Cooper's Hawks through the use of radio-telemetry. Placed video systems on nests to quantify diet content, and completed vegetation surveys. Instructed and managed field technicians, conducted spatial analyses in ArcGIS and statistical analyses, developed and defended scientific thesis and prepared manuscripts for peer-reviewed journal publication.

Research Crew Leader, Pacific Southwest Research Station, Goosenest Adaptive Management Area Project, Goosenest Ranger District, Grass Lake, CA (2004).

Monitored response of songbirds to experimental treatments aimed at restoring interior ponderosa pine forest to a more natural condition through the use of mechanical thinning and prescribed burning. Instructed crew of three in bird identification and in point count, nest searching, territory mapping and vegetation survey techniques. Coordinated data collection efforts and managed project databases.

Research Crew Leader, Pacific Southwest Research Station, Blacks Mountain Experimental Forest Project, Hat Creek Ranger District, Burney, CA (2003).

Investigated response of songbirds to experimental treatments aimed at restoring ponderosa pine forest. Taught crew members identification of study area avifauna and methods for conducting foraging observations, territory mapping, nest searching, and vegetation surveys. Designed and established new plots and transects and coordinated data collection efforts.

Research / Ecological Restoration Intern, UC Santa Barbara Museum of Systematics and Ecology, Santa Barbara, CA (2000-2002).

Assisted with field research and ecological restoration activities including: (1) conducting point counts as part of ongoing effort to catalogue and track changes in avifauna along riparian corridors within Vandenberg Airforce Base, (2) nest searching, trapping and banding of White-tailed Kites for study assessing Kite utilization of wild open spaces and (3) eradicating exotic invasive flora, cultivating and planting native flora, and monitoring experimental vegetation plots on Santa Cruz Island and Coal Oil Point University of California Reserves.

Seasonal Staff Biologist, Point Blue Conservation Science, US Forest Service Plumas-Lassen Administrative Study, Quincy, CA (2002).

Monitored effects of fuels reduction and fire containment treatments on breeding songbirds. Established and conducted point counts and completed vegetation surveys.

Research Assistant, UC Santa Barbara Marine Science Institute, Santa Barbara, CA (2002).

Assisted with investigation of relationships between beach morphodynamics, macrofauna settlement, and shorebird distribution and abundance. Performed quantitative core sampling of sandy beach macrofauna, measured beach morphodynamics, conducted shorebird foraging observations and rack surveys, and processed invertebrates in the lab.

Seasonal Staff Biologist, Point Blue Conservation Science, Eastern Sierra Riparian Songbird Conservation Project, Lee Vining, CA (2001).

Monitored response of breeding songbirds to successional regeneration of riparian habitat along Mono Basin streams. Nest searched, territory mapped, and conducted vegetation surveys.

Publications

Palladini, MA and TL George. Response of Cooper's hawks to experimental pine forest restoration treatments in northeastern California. Journal of Raptor Research: in review

Heath, SK, **MA Palladini**, and S Prentice. 2006. Breeding bird census 2001: Irrigated mixed willow riparian. Bird Populations 7:96.

Heath, SK, **MA Palladini**, and S Prentice. 2006. Breeding bird census 2001: Recovering mixed willow-black cottonwood riparian II. Bird Populations 6: 97-98

Technical Skills

- Conducting spatial analyses and creating maps using ArcGIS software
- Conducting statistical analyses using SAS, NCSS, and SPSS statistical software
- Navigating and collecting/processing data using GPS hardware and software
- Authoring scientific manuscripts
- Trapping and handling raptors, and mist-netting and processing songbirds
- Conducting research with radio-telemetry, wildlife videography and wildlife camera systems
- Identifying western North American bird species by sight and sound (highly proficient)
- Identifying California flora
- Developing silvicultural prescriptions and forest management plans
- Designing wetland, oak woodland, riparian and grassland restoration projects

Attachment 2

Napa Botanical
SURVEY SERVICES

Subject: Davis Friesen Vineyard Project DEIR Review, October 1, 2015

Dear Mr. Palladini,

I have reviewed the Draft Environmental Impact Report (DEIR), Timber Harvest Plan, and Technical Reports prepared for the Friesen Vineyard Project. I focused on the documents' discussion and proposed mitigation of impacts to flora at the project site and the surrounding wildland properties. My review revealed the following deficiencies in the documents' analysis.

General Inaccuracies and Errors in the Environmental Documents

While the report contains a lot of boilerplate, some of the actual data is likely to be erroneous. The EIR's description of plant communities includes species not listed in the Biological Appendix plant list, suggesting that the botanist did not search the property in enough detail to describe what actually is present onsite. For example Manzanita Chaparral is described as including *Arctostaphylos viscida* and *Ceanothus jepsonii*. DEIR 4.4-18. These are 99%+ unlikely to occur on the property because if on the site, serpentine soils would also be present. There is no evidence of serpentine soils on the project site.

The Biological Appendix's listing of *Plagiobothrys bracteatus*, an obligate wetland species, and *Mimulus angustatus*, which the Biological Appendix lists as present in "Wet depressions, vernal pools," and *Limnanthes douglasii* listed in the Biological Appendix as occurring in wet meadows suggests the presence of a vernal pool or seasonal wetland on the Project site. This was not discussed in the DEIR which stated there are no wetlands or vernal pools on the Project site.

Block C is described as Mixed Oak Alliance but there is a component of Ponderosa Pine (evident on Google Earth) that is not discussed. This vegetation polygon is likely mislabeled. Ponderosa Pine is very limited in distribution in Napa County and even if part of a co-dominated community, would mean the project would have a greater impact than considered in the DEIR. The DEIR must examine impacts to Ponderosa Pine Alliance or co-dominated Oak and Ponderosa Pine Alliance.

I have also reviewed the THP and see no tabulation of the trees to be removed. DEIRs commonly contain lists of tree species removal by block, species and DBH (tree diameter at 4.5 feet above ground). The lack of any discussion or quantification of this Project's tree removal is a conspicuous oversight. Tree tabulations are necessary to get a better sense of the accuracy of the plant community designations, especially when there are contradictions between the DEIR consultants data and other information about the Project site. The DEIR cannot accurately analyze the project's impacts without this information.

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Several species are also misspelled in the DEIR text and Appendix list. [e.g. *Adenostoma fasciculatum, Toxicodendron diversilobum, Arbutus menziesii*] This suggests a hasty composition of these documents.

Species Not Adequately Considered

The questionable quality of information raises a flag as to how well the consultant actually searched the site. Monthly visits were made from February to June but the lack of a late season visit prevents the documents' ability to exclude some of the following species included in CNDDB. Special status species that were improperly omitted from the study include:

Antirrhinum virga – I observed this species along Friesen Drive near a culvert north of the Davis property lake in 2007 and 2008.

Erigeron bioletti – this species is found around boulders in chaparral or oak woodland, and was observed at Wildlake in 2006. This species blooms from June to September.

Erigeron greenei – this species can occupy volcanic rock outcrops, a preferred habitat that exists on the Project site. The DEIR's biological consultant was the biological consultant for the Circle S Ranch Vineyard Project in Napa County and missed a number of populations of this species at that project site, west of Atlas Peak, and may lack a good search image for it. A partial search of that property (June 2015) revealed this species occurs in at least 3 locations.

Harmonia nutans – has been observed along the Friesen Drive by staff at the Land Trust of Napa County and probably occurs on both block B and C. Again, the DEIR's biological consultant missed this same species at Circle S.

Eriogonum umbellatum var. *bahiaforme* – potential habitat may occur. Present at Montesol, roughly 4.5 miles north of the Project site, in chaparral at similar altitude. This species blooms between June and August and could have been missed due to the lack of late season surveying.

Juglans hindsii – this species can occur anywhere in the county.

Layia septentrionalis – may occur in chaparral or oak woodlands on the Project site. It occurs at Montesol, 5 miles to the north, and Chiles Canyon, roughly 10 miles to the south. (Blooms Apr-May)

Leptosiphon latisectus – possible to find in rocky soils, chaparral, and oak woodlands, which are all present on the Project site.

Monardella viridis – this species is included in the Biological Appendix but was not discussed in the DEIR text. Any populations existing on the Project site should be discussed and analyzed for potentially significant impacts.

Triteleia lugens – this species occur in brushy habitats, occasionally in forest, and prefers rocky volcanic (rhoylitic) soils. These conditions exist on the Project site. A cryptic species, it could be easily overlooked if it was not included on the search list.

Brodiaea leptandra – the consultant's June survey was most likely too early to identify this species. At this elevation, a July bloom would be expected.

Leptosiphon jepsonii - Although it is stated as no habitat present, habitat for this species may occur based on the presence of other species listed in the Appendix such as *Lasthenia californica*, *Collinsia sparsiflora* and *Plantago erecta*. No species of *Leptosiphon* was listed in the Appendix, but this species is found nearby at Wildlake. The DEIR should have surveyed for this species. This again suggests poor coverage of the consultant's search.

Mimulus breviflorus and *Calochortus albus* are listed in the Appendix but have not been previously recorded in Napa County. These first-time identifications are significant and the DEIR must analyze the project's impacts to these species.

Inadequate Mitigation

Mitigation measure 4.4-1 proposes to mitigate oak woodland loss by "enhancing" existing resources on the project site. Foothill Pine and common manzanita will be removed from the vegetation type labeled Foothill Pine Alliance to encourage oak canopy. This should not be considered mitigation but is instead degradation of the property's Foothill Pine habitat affecting yet another portion of the biological values of the property. This activity is unsustainable and will affect the herbaceous plant and wildlife composition of this Foothill Pine community. A plant community includes a complex of species from plants to mammals, birds, reptiles, insects to fungus and lichens. Removal of pines will eliminate species that feed and nest on them, and will in turn affect other organisms utilizing the former as resources. The proposed mitigation will significantly disturb this complex food web.

This mitigation is also counter to the Napa County Natural Resource goal CON 2, which requires maintaining and enhancing the existing level of biodiversity. Eliminating pine and chaparral from this plant community is expected to reduce, not enhance the existing level of biodiversity. Napa County goal CON 4 provides for the conservation, protection, and improvement of plant and wildlife habitats for species native to Napa County. The habitat destruction proposed by this mitigation measure is also contrary to this goal.

Mitigation measure 4.4-3 suggests moving a population of *Lomatium repostum*. This is highly unlikely to be successful over time and should not be viewed as mitigation. The Appendix suggests this species is easy to cultivate but this species is never common, very localized, and depends on a specific set of habitat conditions including thin, hard volcanic soils. I am unaware of any successful efforts to propagate this species in the manner proposed and the consultant should provide empirical data to support such a proposal. Replication of this species is very likely to fail.

Impacts to Wetlands and Waterbodies

A main issue with the Project relative to the nearby Wildlake is the placement of Block B on the slope above the small stream that sits against a blue line stream on its southern margin. This stream feeds into Wildlake and has the potential to affect the wetland area downstream. Wetlands are very limited

on the Dunn/Wildlake Preserve and this one will not likely be sustainable with the erosion and runoff of fertilizers and chemicals used on the vineyard. I have seen algae blooms in vernal pools when subjected to runoff. The DEIR must consider the impact of nutrients, pesticides, and sediment running off into these wetlands and into Wildlake.

More substantial setback of the development from streams and the access road are necessary to mitigate the visual and biological impacts to the Preserve.

Impacts from Invasive Species One additional issue I see with vineyards going in next door to the Wildlake Preserve is the increased potential for invasive species. Cultivating equipment should be dedicated for use only on the site, and herbicide use should be avoided along roadways. Cultivation and herbicides clear soil creating a niche for colonizing species. While a few of these are native, most are exotic (non-native). Some depend on regular disturbance but others adapt to natural habitats. Some of these are slow to invade and easy to control but a few are explosive invaders and displace native annuals and perennials even to the point of becoming a dominant species. The DEIR must consider the potential for these invasive species to colonize the project site and impact the preserved wildlands neighboring the site.

Jake Ruygt

Jake Ruygt

Napa Botanical Survey Services

JAKE A. RUYGT

3549 Willis Dr.
Napa, CA 94558
(707) 253-1839

Experience 1975-Present *Jake A. Ruygt Garden Maintenance*
Business Owner – Napa, CA

- Commercial and Residential Landscape Maintenance and Installation, C27 - state contractors license (# 589877) since 1990. Maintenance contracts include small residential, small to medium sized commercial properties, and condominium complexes. Member of the California Landscape Contractors Association; hold a Pesticide Applicators Certificate.

1988-Present *Napa Botanical Survey Services*
Business Owner – Napa, CA

- Consulting Botanist – On the California Department of Fish and Wildlife list of qualified botanists to conduct rare plant survey work in the Napa, Lake, Sonoma, and Solano County area. Have completed numerous contracts as a consultant or subconsultant to assess potential impacts of a variety of development projects on rare plant populations and vegetation communities. Have conducted numerous botanical resource inventories. Contracts have been completed for James C. Hanson Engineering, Drew Aspergren Engineering, EIP, WESCO, Levine-Fricke, Peter Reichers and Associates, Garcia & Associates, Napa Sanitation District, Napa County Resource Conservation District, Napa County Flood Control District, The Land Trust of Napa County, Napa County Regional Park and Open Space District, Sonoma County Agricultural Preservation & Open Space District, The Nature Conservancy, Information Center For the Environment (ICE), Army Corps of Engineers, California Department of Fish and Game (Wildlife), and numerous private property owners.

- Team member in the development of management plans for Newell Open Space Preserve and Archer Taylor Preserve in Napa County (Land Trust). Consulted to the Napa County Flood Control District during the phase 1A transplant of *Lilaeopsis masonii* on the lower Napa River. Contracted by Friends of the Napa River to work as a member of the Historical Ecology Project, mapping historic valleys oaks and remnant vegetation of the Napa River Watershed. Worked with ICE (UC Davis) to ground truth vegetation during a Napa County Vegetation Mapping project in 2002. The products of this work were used to develop the first county-wide vegetation map in the nation utilizing aerial photography.

Published work includes:

- 100 Napa County Roadside Wildflowers – 1996. Co-author with Dr. Richards Lyon, retired physician. 97 pp.
- Ecological Studies of Clara Hunt's Milkvetch *Astragalus clarianus* and a Proposal for Habitat Restoration at Conn Valley Road, Napa County – July 1994. Submitted to the Endangered Plant Program, California Department of Fish and Game. 97 pp.
- Ecological Studies and Demographic Monitoring of Soft Bird's Beak *Cordylanthus mollis ssp. mollis* A California Listed Rare Plant Species – September 1994. Submitted to the Endangered Plant Program, CDFG. 171 pp.
- Oaks in Napa County – 1990. A collaboration with Joe Callizo, Napa County botanist/ naturalist. 2 pp.

1985-present *The California Native Plant Society*
Conservation Chairman and **Rare Plant Chairman (**since 1995**)-** Napa Valley Chapter. Duties include:

- Review and comment on environmental documents (EIR, THP, etc.) and impending legislation.
- Conduct Annual Plant Watch field trips to monitor rare plant sites.
- Comment to State Water Resources Control Board of possible rare plant impacts related to water applications.
- Submit rare plant information to Napa County Conservation, Development and Planning Department to maintain Environmental Sensitivity Maps. Worked with county cartographer to develop accurate map data.
- Submit rare plant field survey forms for newly found or monitored rare plant sites to the Natural Diversity Database, a CDFW branch, Sacramento.
- Maintain maps and reports of rare plants and vernal pools in Napa County.
- Petition State or Federal Government to list rare threatened or endangered plant species occurring in Napa County. Submitted documentation to support the (successful) listing of *Cordylanthus (Chloropyron) mollis ssp. mollis, Poa napensis, Plagiobothrys strictus, Lasthenia conjugens, Navarretia leucocephala ssp. pauciflora, Astragalus clarianus, Castilleja affinis ssp. neglecta.*
- Conduct plant community field surveys to assist in a CDFW program to identify endangered plant communities.
- Lead field trips instructing participants in native plant and identification and ecology.

Education

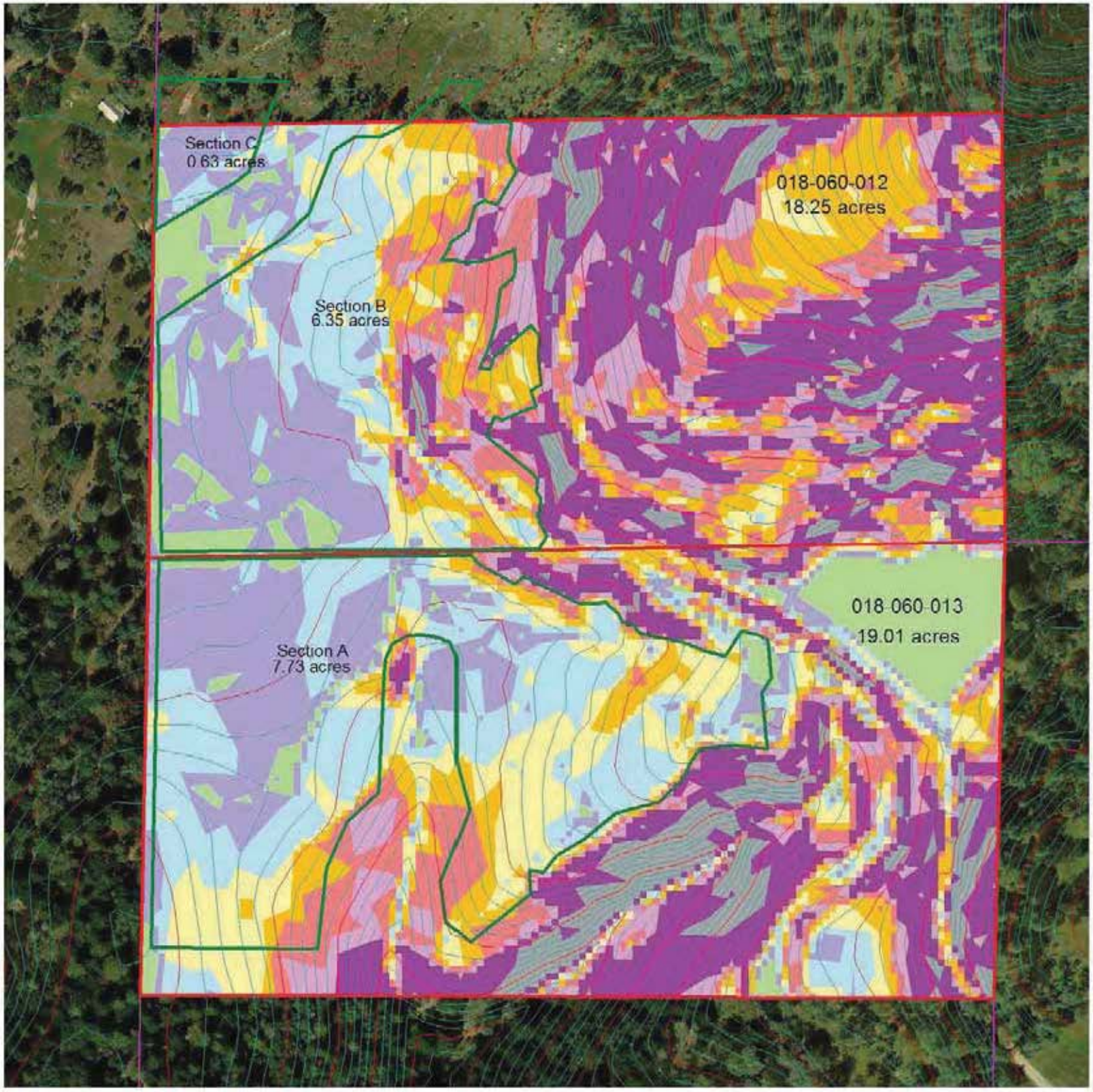
1971-1973 *Napa Community College*, Napa, CA
A.S. degree

1973-1975 *University of California*, Davis, CA
B.S., Wildlife and Fisheries Biology – Wildlife specialty

Interests

Flora of Napa County – Nearing completion of a publishable flora of over 1680 known varieties of plants, native or naturalized in Napa County. This includes 40 years of fieldwork in the county. Fieldwork results have been shared with many parties in the form of comprehensive Area Species Lists (Mead Ranch, Devil's Canyon, Mt. George, Mt. St. Helena, Westwood Hills, Alston Park, Bogg's Mountain, Rush Ranch, Wildlake Ranch and others). Field studies have advanced the understanding of rare plant distribution and plant diversity of Napa County including publication of newly recognized species including *Castilleja ambigua* var. *meadii*, *Sidalcea hickmanii* ssp. *napensis*, and *Trichostema ruygtii*.

Attachment 3



Michael Davis
Friesen Road Properties
Napa APN:
018-060-012
018-060-013

Napa Valley Vineyard Eng. (study area)
Property Lines
Slope (%)
0 - 5
5 - 10
10 - 15
15 - 20
20 - 25
25 - 30
30 - 35
35 - 50
GT 50
Elevation Contours
5 ft. contours
25 ft. contours
Parcels_public.shp

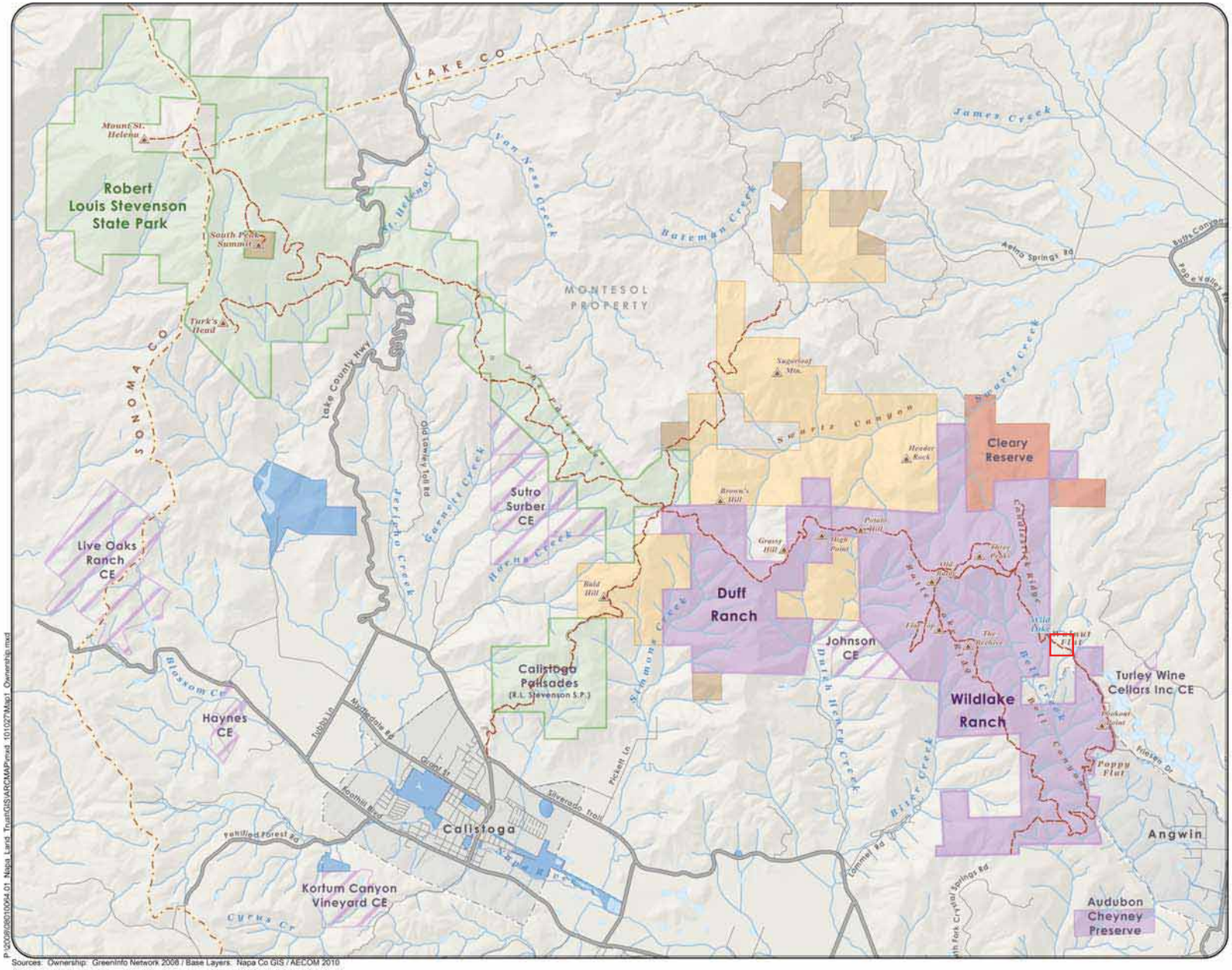
N
W
E
S

100 0 100 200 Feet

Aerial Photo: Napa County Ortho 2011

Anamora Inc. - Vineyard Soil Technologies
3379 Solano Ave. #505, Napa, CA 94558
Phone / Fax: (707) 255-3170
www.VineyardSoil.com

Attachment 4



Land Trust of Napa County

The Land Trust of Napa County's Dunn-Wildlake and Duff Ranch Preserves (Wildlake-Duff) protect over 4,000 acres in the heart of the Howell Mountains. A number of other conservation areas surround Wildlake-Duff, including the 5,273 acre Robert Louis Stevenson State Park, bringing the entire assemblage to over 12,000 acres. This regionally significant natural area stretches more than 15 contiguous miles from the community of Angwin to Mount St. Helena.

Attachment 5

Biodiversity hotspots for conservation priorities

Norman Myers*, **Russell A. Mittermeier**†, **Cristina G. Mittermeier**†, **Gustavo A. B. da Fonseca**‡ **& Jennifer Kent**§

* *Green College, Oxford University, Upper Meadow, Old Road, Headington, Oxford OX3 8SZ, UK*
† *Conservation International, 2501 M Street NW, Washington, DC 20037, USA*
‡ *Centre for Applied Biodiversity Science, Conservation International, 2501 M Street NW, Washington, DC 20037, USA*
§ *35 Dorchester Close, Headington, Oxford OX3 8SS, UK*

Conservationists are far from able to assist all species under threat, if only for lack of funding. This places a premium on priorities: how can we support the most species at the least cost? One way is to identify 'biodiversity hotspots' where exceptional concentrations of endemic species are undergoing exceptional loss of habitat. As many as 44% of all species of vascular plants and 35% of all species in four vertebrate groups are confined to 25 hotspots comprising only 1.4% of the land surface of the Earth. This opens the way for a 'silver bullet' strategy on the part of conservation planners, focusing on these hotspots in proportion to their share of the world's species at risk.

The number of species threatened with extinction far outstrips available conservation resources, and the situation looks set to become rapidly worse[1–4]. This places a premium on identifying priorities. How can we protect the most species per dollar invested? This key question is at the forefront of conservation planning, and forms the focus of this article. By concentrating on areas where there is greatest need and where the payoff from safeguard measures would also be greatest, conservationists can engage in a systematic response to the challenge of large-scale extinctions ahead.

A promising approach is to identify 'hotspots', or areas featuring exceptional concentrations of endemic species and experiencing exceptional loss of habitat[5–9]. Here we focus on species, rather than populations or other taxa, as the most prominent and readily recognizable form of biodiversity. This is not to suggest that populations and even ecological processes are not important manifestations of biodiversity, but they do not belong in this assessment. There are other types of hotspot[10,11], featuring richness of, for example, rare[12,13] or taxonomically unusual species[14,15]. This article considers only hotspots as defined above. Concentrating a large proportion of conservation support on these areas would go far to stem the mass extinction of species that is now underway.

The hotspots' boundaries have been determined by 'biological commonalities'. Each of the areas features a separate biota or community of species that fits together as a biogeographic unit. This is apparent in the case of islands or island groups such as New Caledonia, New Zealand, the Caribbean, Polynesia/Micronesia, Madagascar and the Philippines. Much the same applies to 'ecological islands' in clearly defined continental units such as the Cape

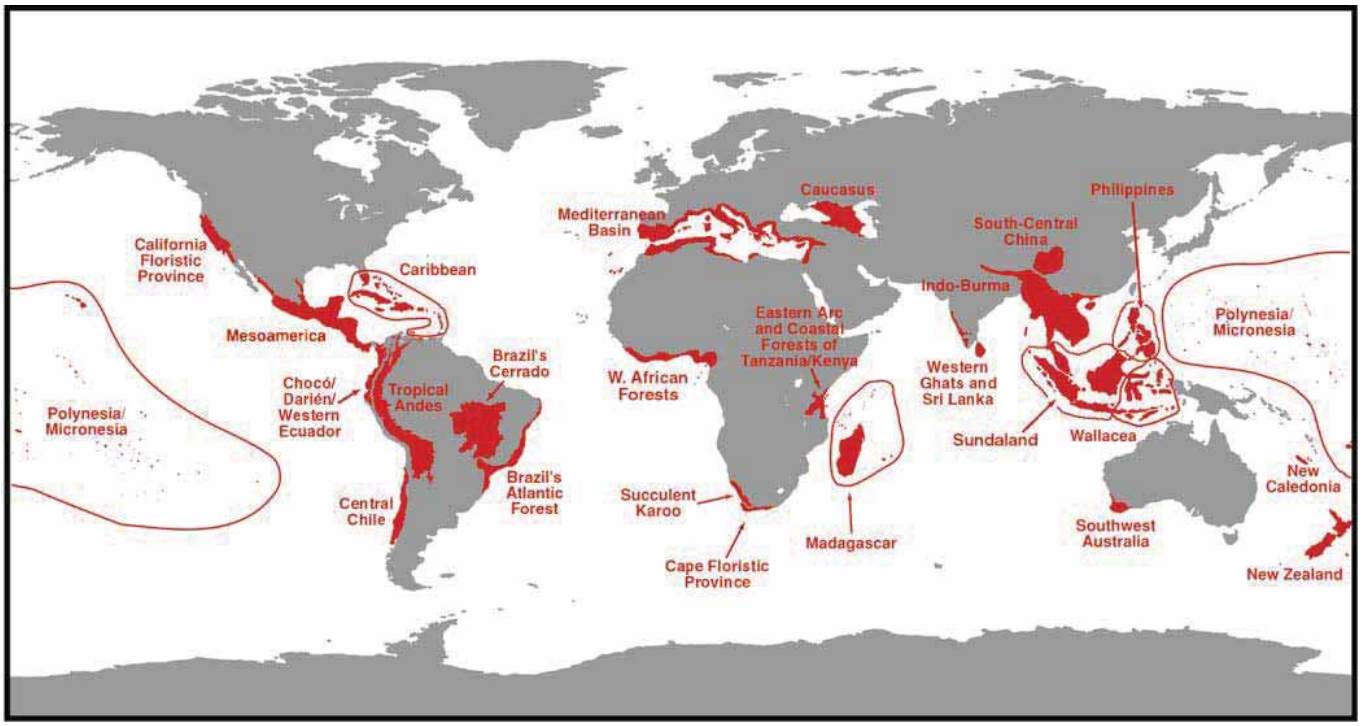


Figure 1 The 25 hotspots. The hotspot expanses comprise 30–3% of the red areas.

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Floristic Province, the Eastern Arc and Coastal Forests of Tanzania/Kenya (hereafter abbreviated to 'Eastern Arc'), southwestern Australia and Caucasus. In other areas the definition of a hotspot's boundaries derives from recognized divisions such as Wallace's line between Sundaland and Wallacea, or the Kangar–Pattani line between Indo-Burma and Sundaland. In still other areas, the definition reflects a best-judgement opinion from experts in the field. Were larger hotspots, for example, the Tropical Andes, Mesoamerica, Indo-Burma and Sundaland to be subdivided into areas the size of the smaller hotspots, they would still meet the criterion of biological commonalities; and the result would be a far larger number of mini-hotspots, making for a much more complicated assessment and diffusing the essential strategy of just 25 hotspots designated for priority conservation.

This article is a qualitative as well as a quantitative advance on a preliminary effort[5,6], which limited itself to vascular plants in 18 hotspots. The number of hotspots has been increased to 25. More importantly, the expanded criteria require that a hotspot contains endemic plant species comprising at least 0.5% of all plant species world-wide. Here we include four categories of vertebrate species, bringing the number of endemics to almost three times more than in the earlier papers. We analyse key questions of species/area ratios and congruence among taxa. Finally, we present a way to determine the hottest hotspots and thus to pinpoint super priorities.

Analytic methods

The basic analysis is driven by two criteria: species endemism and degree of threat. The main source of data for both plants and vertebrates has been more than 100 scientists with abundant experience in countries concerned and around 800 references in the professional literature (see Supplementary Information). Additional details are available in ref. 16; supplementary sources on plants include refs 17–19. The species dimension is based in the first instance on vascular plants (comprising around 90% of all plants, and hereafter referred to as 'plants'), as they are essential to virtually all forms of animal life and are fairly well known scientifically. To qualify as a hotspot, an area must contain at least 0.5% or 1,500 of the world's 300,000 plant species[20] as endemics. In fact, 15 of the 25 hotspots contain at least 2,500 endemic plant species, and 10 of them at least 5,000.

The four vertebrate groups, mammals, birds, reptiles and amphibians, comprise 27,298 species, consisting of 4,809 mammals[21], 9,881 birds[22], 7,828 reptiles[23] and 4,780 amphibians[24]. The other vertebrate group, fishes, is excluded because data are generally poor (there could well be at least 5,000 species waiting to be discovered[25], or more than all mammals). Hereafter 'vertebrates' refers to all vertebrates except fishes. Vertebrates do not serve as an alternative determinant of hotspot status, nor do their endemics have to comprise 0.5% of global totals. If an area qualifies by the 0.5% plants criterion (and the habitat threat criterion), it makes the list. Vertebrates serve as back-up support, and also to determine congruence and to facilitate other comparisons among the hotspots.

The analysis omits invertebrates, which are largely undocumented but probably make up at least 95% of all species, the bulk of them insects. To the extent that the five categories of endemic species assessed are sometimes matched by similar concentrations of endemic insect species, the hotspots thesis can be applied to invertebrates as well. In any case, if we were to lose, say, half of endemic plant species, we could well lose a large and perhaps similar proportion of insect species. The fig genus, for example, being the most widespread of plant genera in the tropics, comprises more than 900 species, each of which is pollinated by a single wasp species; conversely, the wasps depend on the figs' ovaries as sites for their larvae to develop[26]. Although the plant/insect connection is variable in general application[27–30], it is supported by the many pollination, herbivory and other relationships between plants and insects.

The endemism data tend to be minimalist for two reasons. One is the lack of recent documentation in the form of, for example, modern floras. For instance, there is no up-to-date account of Brazil's plant species even though the country is believed to harbour the Earth's richest flora, at least 50,000 species or one-sixth of the planetary total. Second, and more importantly, endemism data almost always relate only to individual countries or parts of countries, whereas 12 of the hotspots extend across two or more countries and six across four or more countries. In these cases, it has been difficult to compute regional totals for hotspot-wide endemics,

Table 1 The 25 hotspots

Hotspot	Original extent of primary vegetation (km^2)	Remaining primary vegetation (km^2) (% of original extent)	Area protected (km^2) (% of hotspot)	Plant species	Endemic plants (% of global plants, 300,000)	Vertebrate species	Endemic vertebrates (% of global vertebrates, 27,298)
Tropical Andes	1,258,000	314,500 (25.0)	79,687 (25.3)	45,000	20,000 (6.7%)	3,389	1,567 (5.7%)
Mesoamerica	1,155,000	231,000 (20.0)	138,437 (59.9)	24,000	5,000 (1.7%)	2,859	1,159 (4.2%)
Caribbean	263,500	29,840 (11.3)	29,840 (100.0)	12,000	7,000 (2.3%)	1,518	779 (2.9%)
Brazil's Atlantic Forest	1,227,600	91,930 (7.5)	33,084 (35.9)	20,000	8,000 (2.7%)	1,361	567 (2.1%)
Choc/Darien/Western Ecuador	260,600	63,000 (24.2)	16,471 (26.1)	9,000	2,250 (0.8%)	1,625	418 (1.5%)
Brazil's Cerrado	1,783,200	356,630 (20.0)	22,000 (6.2)	10,000	4,400 (1.5%)	1,268	117 (0.4%)
Central Chile	300,000	90,000 (30.0)	9,167 (10.2)	3,429	1,605 (0.5%)	335	61 (0.2%)
California Floristic Province	324,000	80,000 (24.7)	31,443 (39.3)	4,426	2,125 (0.7%)	584	71 (0.3%)
Madagascar*	594,150	59,038 (9.9)	11,548 (19.6)	12,000	9,704 (3.2%)	987	771 (2.8%)
Eastern Arc and Coastal Forests of Tanzania/Kenya	30,000	2,000 (6.7)	2,000 (100.0)	4,000	1,500 (0.5%)	1,019	121 (0.4%)
Western African Forests	1,265,000	126,500 (10.0)	20,324 (16.1)	9,000	2,250 (0.8%)	1,320	270 (1.0%)
Cape Floristic Province	74,000	18,000 (24.3)	14,060 (78.1)	8,200	5,682 (1.9%)	562	53 (0.2%)
Succulent Karoo	112,000	30,000 (26.8)	2,352 (7.8)	4,849	1,940 (0.6%)	472	45 (0.2%)
Mediterranean Basin	2,362,000	110,000 (4.7)	42,123 (38.3)	25,000	13,000 (4.3%)	770	235 (0.9%)
Caucasus	500,000	50,000 (10.0)	14,050 (28.1)	6,300	1,600 (0.5%)	632	59 (0.2%)
Sundaland	1,600,000	125,000 (7.8)	90,000 (72.0)	25,000	15,000 (5.0%)	1,800	701 (2.6%)
Wallacea	347,000	52,020 (15.0)	20,415 (39.2)	10,000	1,500 (0.5%)	1,142	529 (1.9%)
Philippines	300,800	9,023 (3.0)	3,910 (43.3)	7,620	5,832 (1.9%)	1,093	518 (1.9%)
Indo-Burma	2,060,000	100,000 (4.9)	100,000 (100.0)	13,500	7,000 (2.3%)	2,185	528 (1.9%)
South-Central China	800,000	64,000 (8.0)	16,562 (25.9)	12,000	3,500 (1.2%)	1,141	178 (0.7%)
Western Ghats/Sri Lanka	182,500	12,450 (6.8)	12,450 (100.0)	4,780	2,180 (0.7%)	1,073	355 (1.3%)
SW Australia	309,850	33,336 (10.8)	33,336 (100.0)	5,469	4,331 (1.4%)	456	100 (0.4%)
New Caledonia	18,600	5,200 (28.0)	526.7 (10.1)	3,332	2,551 (0.9%)	190	84 (0.3%)
New Zealand	270,500	59,400 (22.0)	52,068 (87.7)	2,300	1,865 (0.6%)	217	136 (0.5%)
Polynesia/Micronesia	46,000	10,024 (21.8)	4,913 (49.0)	6,557	3,334 (1.1%)	342	223 (0.8%)
Totals	17,444,300	2,122,891 (12.2)	800,767 (37.7)	†	133,149 (44%)	†	9,645 (35%)

Documentation of plant and vertebrate species and endemism can be found in Supplementary Information.
* Madagascar includes the nearby islands of Mauritius, Reunion, Seychelles and Comores.
† These totals cannot be summed owing to overlapping between hotspots.

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and we have often had to depend on best-judgement estimates by over 100 scientists with abundant experience in the countries concerned. In a few instances, we have had to accept a simple summation of country-by-country totals, which surely underestimates regional totals. To this extent, many of the endemism estimates are distinctly conservative.

A second determinant of hotspot status, applied only after an area has met the 'plants' criterion, is the degree of threat through habitat loss. To qualify, a hotspot should have lost 70% or more of its primary vegetation, this being the form of habitat that usually contains the most species, especially endemics. Eleven hotspots have already lost at least 90% and three have lost 95%. The 70% cutoff is justified on the grounds that most large-scale concentrations of endemic plant species occur within the 25 hotspots as delineated. Other concentrations of plant endemics with perhaps another 15% of the Earth's plant species occur in three regions designated as 'major tropical forest wilderness areas', each retaining 75% of its primary vegetation (see below). There are few other areas with comparable concentrations. Moreover, were the 70% cutoff to be replaced with 60%, this would admit hardly any other hotspots, whereas a 90% cutoff would exclude 11 of the hotspots.

Finally, the analysis is limited to the terrestrial realm (Conservation International is preparing an analysis of marine species and conservation priorities).

The area-by-area findings are presented in Tables 1–6 and Fig. 1. For further information regarding the sources of our statistics, see the list of references and experts in Supplementary Information.

There is variability in the precision and accuracy of data. This is to be expected given the range of areas and the degree of documentation available. In many instances, the statistical information is considered to be accurate to within 5%. In most others, it is sufficiently accurate to rank as sound support for working estimates. For example, the Tropical Andes is believed to contain at least 20,000 known plant endemics, this being a rounded figure (many more species, probably thousands, remain to be discovered there). Another 14 such totals are rounded. The Cape Floristic Province, by contrast, is considered to contain exactly 5,682 known plant endemics; the same precision applies to another nine hotspots. Similar considerations apply to vertebrate data and to estimates of remaining primary vegetation.

This overall approach, uneven as it is, is justified for an analysis that seeks to convert a profound problem into a fine opportunity. After all, to decide that a potential hotspot should not be evaluated because it lacks a conventional degree of accurate data is effectively to decide that its conservation needs cannot be evaluated either, in which case its cause tends to go by default. Uncertainty can cut both ways.

Chief findings

The 25 hotspots contain the remaining habitats of 133,149 plant species (44% of all plant species world-wide; Table 1) and 9,645 vertebrate species (35%; Table 2). These endemics are confined to an aggregate expanse of 2.1 million square kilometres, or 1.4% of the Earth's land surface. They formerly occupied 17.4 million square kilometres or 11.8% of the Earth's land surface. They are so threatened that, having already lost an aggregate of 88% of their primary vegetation, they all seem likely, in the absence of greatly increased conservation efforts, to lose much if not most of their remaining primary vegetation within the foreseeable future.

The 25 hotspots feature several habitat types at global scale. Predominant are tropical forests, appearing in 15 hotspots, and Mediterranean-type zones, in five. Nine are mainly or completely made up of islands; almost all tropical islands fall into one or another hotspot. Sixteen hotspots are in the tropics, which largely means developing countries where threats are greatest and conservation resources are scarcest.

Leading hotspots

Some hotspots are much richer than others in terms of their numbers of endemics (Table 3). (Three other modes of comparison are presented below.) Each of five hotspots—the Tropical Andes, Sundaland, Madagascar, Brazil's Atlantic Forest and the Caribbean—contains endemic plants and vertebrates amounting to at least 2% of total species world-wide. Together, they comprise 20% and 16%, respectively, of all plants and vertebrates, and 45% of all the hotspots' endemic plants and vertebrates alike, but they comprise a mere 0.4% of the Earth's land surface. At the same time, they feature some of the most depleted habitats: the Caribbean retains only 11.3% of its primary vegetation, Madagascar 9.9%, Sundaland 7.8% and Brazil's Atlantic Forest 7.5%. These five hotspots, with

Table 2 Vertebrate species and endemism

Hotspot	Bird species and endemism		Mammal species and endemism		Reptile species and endemism		Amphibian species and endemism		Total species and endemism	
Tropical Andes	1,666	677	414	68	479	218	830	604	3,389	1,567
Mesoamerica	1,193	251	521	210	685	391	460	307	2,859	1,159
Caribbean	668	148	164	49	497	418	189	164	1,518	779
Brazil's Atlantic Forest	620	181	261	73	200	60	280	253	1,361	567
Choco/Darien/W. Ecuador	830	85	235	60	210	63	350	210	1,625	418
Brazil's Cerrado	837	29	161	19	120	24	150	45	1,268	117
Central Chile	198	4	56	9	55	34	26	14	335	61
California Floristic Province	341	8	145	30	61	16	37	17	584	71
Madagascar	359	199	112	84	327	301	189	187	987	771
Eastern Arc and Coastal Forests of Tanzania/Kenya	585	22	183	16	188	50	63	33	1,019	121
West African Forests	514	90	551	45	139	46	116	89	1,320	270
Cape Floristic Province	288	6	127	9	109	19	38	19	562	53
Succulent Karoo	269	1	78	4	115	36	10	4	472	45
Mediterranean Basin	345	47	184	46	179	110	62	32	770	235
Caucasus	389	3	152	32	76	21	15	3	632	59
Sundaland	815	139	328	115	431	268	226	179	1,800	701
Wallacea	697	249	201	123	188	122	56	35	1,142	529
Philippines	556	183	201	111	252	159	84	65	1,093	518
Indo-Burma	1,170	140	329	73	484	201	202	114	2,185	528
South Central China	686	36	300	75	70	16	85	51	1,141	178
Western Ghats/Sri Lanka	528	40	140	38	259	161	146	116	1,073	355
SW Australia	181	19	54	7	191	50	30	24	456	100
New Caledonia	116	22	9	6	65	56	0	0	190	84
New Zealand	149	68	3	3	61	61	4	4	217	136
Polynesia/Micronesia	254	174	16	9	69	37	3	3	342	223
Total endemics and % of global total	*	2,821 28.5%	*	1,314 27.3%	*	2,938 37.5%	*	2,572 53.8%		9,645 35.3%

* These totals cannot be summed owing to overlapping between hotspots.

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four others, contain endemics amounting to 30.1% and 25.0% of the global totals for plant and vertebrate species, respectively, in 0.7% of the Earth's land surface.

Some hotspots are likewise significant in having their endemic species concentrated in exceptionally small areas (Table 4). The Eastern Arc contains 1,500 endemic plants in 2,000 square kilometres, giving a ratio of 75 species to 100 square kilometres, represented as 75:1, and 121 endemic vertebrates for a ratio of 6.1:1, both ratios topping the lists for all hotspots. Similarly, New Caledonia, with 5,200 square kilometres, works out at 49:1 and 1.6:1, and the Philippines with 9,023 square kilometres at 64.7:1 and 5.7:1. The rest range from 33.3:1 to 1.2:1 for plants and 2.9:1 to 0.03:1 for vertebrates.

Congruence among species categories

In several hotspots there is species congruence insofar as high counts for endemic plants are matched by high counts for endemic vertebrates (Table 5). (For analysis of congruence in other areas, see refs 12 and 31.) This factor reinforces the conservation priority thesis, especially in those hotspots with the most endemic species (Table 3). There can also be high congruence in areas with lower species counts, for example, 80% in the Eastern Arc with 0.5% of plant species and 0.4% of vertebrate species.

Endemic plants in the Tropical Andes comprise 6.7% of all plant species world-wide, and its endemic vertebrates 5.7%, with 85% congruence; Madagascar's species comprise 3.2% and 2.8%, respectively, with 88% congruence; and the Caribbean's 2.3% and 2.9%, with 79%. (The first is a large area where one could expect high congruence; the other two are only one-fifth and one-tenth as big, respectively.) In contrast, Cape Floristic Province possesses 1.9% of all plants but only 0.2% of all vertebrates, for 11% congruence, and the Mediterranean Basin possesses 4.3% of all plants but only 0.9% of all vertebrates, for 21%. Congruence tends to be high in tropical forest hotspots, and generally low in Mediterranean-type hotspots and other drier areas with their meagre counts for endemic vertebrates.

The hottest hotspots

The analysis so far has considered five key factors: numbers of endemics and endemic species/area ratios for both plants and vertebrates, and habitat loss. These factors do not carry equal weight, so they cannot be combined into a single quantitative ranking. For comparative purposes in qualitative fashion, Table 6 lists the eight 'hottest hotspots', which appear at least three times in the top ten listings for each factor. The leaders are Madagascar, the Philippines and Sundaland, appearing for all five factors, followed by Brazil's Atlantic Forest and the Caribbean, appearing for four. Three of these hotspots, Madagascar, the Philippines and the Caribbean, have small areas, which further highlights their importance.

Table 3 Leading hotspots in terms of endemics

Hotspot	Endemic plants (% of global total, 300,000)	Endemic vertebrates (% of global total, 27,298)
Tropical Andes*	20,000 (6.7)	1,567 (5.7)
Sundaland*	15,000 (5.0)	701 (2.6)
Madagascar*	9,704 (3.2)	771 (2.8)
Brazil's Atlantic Forest*	8,000 (2.7)	567 (2.1)
Caribbean*	7,000 (2.3)	779 (2.9)
Sub-totals (% rounded)	59,704 (19.9)	4,385 (16.1)
Mesoamerica	5,000 (1.7)	1,159 (4.2)
Mediterranean Basin	13,000 (4.3)	235 (0.9)
Indo-Burma	7,000 (2.3)	528 (1.9)
Philippines	5,832 (1.9)	519 (1.9)
Totals	90,536 (30.1)†	6,826 (25.0)

*Hotspots with at least 2% of the world's endemic plants and vertebrates, and comprising only 0.4% of the Earth's land surface (all nine amount to 0.7% of the Earth's land surface).
†This would total 30.2% but for rounding of numbers in the individual hotspots.

Two additional hotspots, the Tropical Andes and the Mediterranean Basin, should be considered as hyper-hot candidates for conservation support in light of their exceptional totals of endemic plants: 20,000 and 13,000, respectively. The Tropical Andes is at the top for endemic vertebrates too, and the Mediterranean third after Sundaland for endemic plants, with 34% more than the fourth hotspot. But they do not rank in more than two of the five factor listings. Similarly, Mesoamerica is second for endemic vertebrates (49% more than the third highest), but it scores only tenth for endemic plants.

Higher taxa assessment

The analysis can be complemented by an assessment of endemism among higher taxa such as families and genera. Madagascar (including nearby Indian Ocean islands) possesses 11 endemic families and 310 endemic genera of plants, 5 endemic families and 14 endemic genera of primates, and 5 endemic families and 35 endemic genera of birds. Cape Floristic Province has 6 endemic families and 198 endemic genera of plants; and New Caledonia has 5 endemic families and 112 endemic genera of plants, and 1 endemic family and 3 endemic genera of birds. In contrast, the United States and Canada, with an expanse 8.8 times larger than the 25 hotspots combined, have only two endemic families of plants. Moreover, plant family richness can often serve as a predictor of species richness for certain animal taxa such as mammals, amphibians and reptiles[32].

Action responses

In sum, the 25 hotspots contain the sole remaining habitats of 44% of the Earth's plant species and 35% of its vertebrate species, and these habitats face a high risk of elimination. Many of the hotspots could well contain sizeable proportions of endemic invertebrates. It is often supposed[1–4] that, were the present mass extinction of species to proceed virtually unchecked, between one-third and two-thirds of all species would be likely to disappear within the foreseeable future. The hotspots analysis indicates that much of this problem could be countered through protection of the 25 hotspots.

An aggregate expanse of 800,767 square kilometres, 38% of the hotspots total, is already protected in parks and reserves. True, some of these are little better than 'paper parks', but they offer a modicum of legal status. All are in urgent need of stronger safeguards, including those five hotspots where the protected expanse is as large as the hotspot itself. The areas without any protection at all

Table 4 Species/area ratios per 100 km^2 of hotspots

Hotspot	Endemic plants	Endemic vertebrates
Tropical Andes	6.4	0.5
Mesoamerica	2.2	0.5
Caribbean	23.5	2.6
Brazil's Atlantic Forest	8.7	0.6
Choco/Darien/Western Ecuador	3.6	0.7
Brazil's Cerrado	1.2	0.03
Central Chile	1.8	0.06
California Floristic Province	2.7	0.09
Madagascar	16.4	1.3
Eastern Arc and Coastal Forests of Tanzania/Kenya	75	6.1
Western African Forests	1.8	0.2
Cape Floristic Province	31.6	0.3
Succulent Karoo	6.5	0.15
Mediterranean Basin	11.8	0.2
Caucasus	3.2	0.1
Sundaland	12.0	0.6
Wallacea	2.9	1.0
Philippines	64.7	5.7
Indo-Burma	7.0	0.5
South-Central China	5.5	0.3
Western Ghats/Sri Lanka	17.5	2.9
SW Australia	13.0	0.3
New Caledonia	49.1	1.6
New Zealand	3.1	0.2
Polynesia/Micronesia	33.3	2.2

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Table 5 Congruence between plants and vertebrates

Hotspot	Endemic plants as % of global total (300,000)	Endemic vertebrates as % of global total (27,298)	Congruence (%) (rounded)
Tropical Andes	6.7%	5.7%	85
Mesoamerica	1.7%	4.2%	41
Caribbean	2.3%	2.9%	79
Brazil's Atlantic Forest	2.7%	2.1%	78
Choco/Darien/Western Ecuador	0.8%	1.5%	53
Brazil's Cerrado	1.5%	0.4%	27
Central Chile	0.5%	0.2%	40
California Floristic Province	0.7%	0.3%	43
Madagascar	3.2%	2.8%	88
Eastern Arc and Coastal Forests of Tanzania/Kenya	0.5%	0.4%	80
West African Forests	0.8%	1.0%	80
Cape Floristic Province	1.9%	0.2%	11
Succulent Karoo	0.6%	0.2%	33
Mediterranean Basin	4.3%	0.9%	21
Caucasus	0.5%	0.2%	40
Sundaland	5.0%	2.6%	52
Wallacea	0.5%	1.9%	26
Philippines	1.9%	1.9%	100
Indo-Burma	2.3%	1.9%	83
South-Central China	1.2%	0.7%	58
Western Ghats/Sri Lanka	0.7%	1.3%	54
SW Australia	1.4%	0.4%	29
New Caledonia	0.9%	0.3%	33
New Zealand	0.6%	0.5%	83
Polynesia/Micronesia	1.1%	0.8%	73

amount to 1.3 million square kilometres or 62% of the total area of the hotspots. This expanse surely represents the greatest biodiversity challenge of the foreseeable future, and should be safeguarded through, for example, a 'hotspots rescue fund'. In some areas, outright protection is still the best option. In other areas, this is not feasible because of human settlements and other activities long in place. These areas could receive a measure of protection as 'conservation units' that allow some degree of multiple use provided that species safeguards are always paramount.

This is not to say that protection of the hotspots would safeguard all their species indefinitely. According to the well-established theory of island biogeography[33], when an area loses a large proportion of its original habitat and especially when the remaining habitat is severely fragmented, it will eventually lose some of its species through what are technically known as 'ecological equilibriation' or delayed fallout effects. There is much empirical evidence to support this; for instance, the loss of birds in Brazil's Atlantic forest[34], in Southeast Asia's forests[35], in tropical forests generally[36,37] and in the United Kingdom[38]; of tree species in tropical forests[39]; of forest plants in eastern North America[40]; of primates in Africa's forests[41]; of large mammals in Tanzania[42]; and of species generally[43].

Consider the consequences for the smallest hotspot, the Eastern Arc. The remaining primary vegetation is only 6.7% of the original, and its expanse of 2,000 km^2 is split into no fewer than 128 patches ranging in size from over 100 to 10 or fewer square kilometres. A bigger hotspot, Cape Floristic Province, with an expanse of 18,000 km^2 and 24.3% of its original primary vegetation, is spread around several thousand patches ranging from over 100 to 0.1 km^2.

Although most island-biogeography losses are not likely to ensue for some time, it makes sense to take immediate steps to safeguard the hotspots to avoid an exceptionally large extinction spasm through outright loss of habitat on a scale to swamp island biogeography impacts. As for past extinctions in the hotspots, all too little is known with respect to taxa across the board including invertebrates; however, if we use birds extinct since 1800 as a surrogate we find that nearly 80% of those that disappeared were from hotspot areas.

These considerations apart, the prospect of a mass extinction can be made far less daunting and much more manageable through the hotspots strategy, with its tight targeting of conservation efforts.

The hotspots findings accord well with several other priority-setting analyses. There is a 68% overlap with Birdlife International's Endemic Bird Areas[44], 82% with IUCN/WWF International's Centres of Plant Diversity and Endemism[17] and 92% with the most critical and endangered eco-regions of WWF/US's Global 200 List[45]. The hotspots approach is more comprehensive than the first two because it combines five categories of species, and it is more closely focused than the third.

Other areas appear to feature exceptional plant endemism and exceptional threat, but are not sufficiently documented to meet the hotspots criteria. They include the Ethiopian Highlands, the Angola Escarpment, southeastern China, Taiwan, and the forests of the Albertine Rift in eastern Democratic Republic of Congo (formerly Zaire), southwestern Uganda and northern Rwanda. Much better known and with a high species/area ratio but without sufficient endemic plant species to qualify as a hotspot is the so-called Wet Tropics and adjacent tropical forest tracts along the Queensland coast in Australia, containing around 1,200 endemic plants in less than 11,000 km^2. Adding these areas to the hotspots list would increase the total of plants endemics by only a few per cent.

In addition, there are a few tropical forest expanses, known as 'major wilderness areas'[46] or 'good news' areas[5,6]. They total some 6–7 million km^2 and feature concentrations of endemic species while retaining at least 75% of their primary vegetation, and have fewer than five people per square kilometre. One is the island of New Guinea, with around 15,000 endemic plants. Others include the Guayana Shield of northeastern Amazonia, the lowlands of western Amazonia and the Congolian Forest, with perhaps another 30,000 endemic plants. Were these regions to compose a supplementary conservation strategy, they could increase the number of plants endemics to almost 60% of all plant species in roughly 5% of the Earth's land surface.

Funding

Since the original hotspots strategy[5,6] began to be implemented in 1989, some $400 million has been invested by the MacArthur Foundation, the W. Alton Jones Foundation, Conservation International, the World Wildlife Fund and other non-governmental organizations. An annual average of $40 million over 10 years is only a tiny fraction of the amount spent per year on biodiversity

Table 6 The eight hottest hotspots in terms of five factors

Hotspot	Endemic plants		Endemic vertebrates		Endemic plants/area ratio (species per 100 km^2)		Endemic vertebrates/area ratio (species per 100 km^2)		Remaining primary vegetation as % of original extent		Times appearing in top 10 for each of five factors
Madagascar	9,704	4	771	4	16.4	8	1.3	7	9.9	9	5
Philippines	5,832	8	518	9	64.7	2	5.7	2	3.0	1	5
Sundaland	15,000	2	701	5	12.0	10	0.6	10=	7.8	7	5
Brazil's Atlantic Forest	8,000	5	654	6	8.7		0.6	10=	7.5	6	4
Caribbean	7,000	6=	779	3	23.5	6	2.6	4	11.3		4
Indo-Burma	7,000	6=	528	8	7.0		0.5		4.9	3	3
Western Ghats/Sri Lanka	2,180		355		17.5	7	2.9	3	6.8	5	3
Eastern Arc and Coastal Forests of Tanzania/Kenya	1,500		121		75.0	1	6.1	1	6.7	4	3

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conservation by governments and international agencies, these funds being assigned mainly to across-the-board activities rather than the concentrated efforts advocated here. The traditional scattergun approach of much conservation activity, seeking to be many things to many threatened species, needs to be complemented by a 'silver bullet' strategy in the form of hotspots with their emphasis on cost-effective measures.

We could go far towards safeguarding the hotspots and thus a large proportion of all species at risk for an average of $20 million per hotspot per year over the next five years, or $500 million annually. Although this is 12.5 times the annual average of the $400 million spent on hotspots over the past decade, it is still only twice the cost of a single Pathfinder mission to Mars, which has been justified largely on biodiversity grounds (the search for extraterrestrial life). The $500 million annually is to be compared, moreover, with a recent estimate[47] for a comprehensive conservation programme to protect biodiversity world-wide costing $300 billion annually—a total that should, in turn, be compared with subsidies of various sorts that degrade environments and economies alike, amounting to $1.5 trillion annually world-wide[48].

Finally, recall that the mass extinction of species, if allowed to persist, would constitute a problem with far more enduring impact than any other environmental problem. According to evidence from mass extinctions in the prehistoric past, evolutionary processes would not generate a replacement stock of species within less than several million years. What we do (or do not do) within the next few decades will determine the long-term future of a vital feature of the biosphere, its abundance and diversity of species. This expanded hotspots strategy offers a large step toward avoiding an impoverishment of the Earth lasting many times longer than *Homo sapiens* has been a species.

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1. Ehrlich, P. R. Energy use and biodiversity loss. *Phil. Trans. R. Soc. Lond. B* **344,** 99–104 (1994).
2. Myers, N. Two key challenges for biodiversity: discontinuities and synergisms. *Biodiversity Cons.* **5,** 1025–1034 (1996).
3. Pimm, S. L., Russell, G. J., Gittleman, J. L. & Brooks, T. M. The future of biodiversity. *Science* **269,** 347–350 (1995).
4. Wilson, E. O. *The Diversity of Life* (Belknap, Cambridge, Massachusetts, 1992).
5. Myers, N. Threatened biotas: 'hotspots' in tropical forests. *Environmentalist* **8,** 187–208 (1988).
6. Myers, N. The biodiversity challenge: expanded hotspots analysis. *Environmentalist* **10,** 243–256 (1990).
7. Pressey, R. L., Humphries, C. J., Margules, C. R., Vane-Wright, R. I. & Williams, P. H. Beyond opportunism: key principles for systematic reserve selection. *Trends Ecol. Evol.* **8,** 124–128 (1993).
8. Prendergast, J. R., Quinn, R. M. & Lawton, J. H. The gaps between theory and practice in selecting nature reserves. *Cons. Biol.* **13,** 484–492 (1999).
9. Ginsberg, J. Global conservation priorities. *Cons. Biol.* **13,** 5 (1999).
10. Dobson, A. P., Rodriguez, J. P., Roberts, W. M. & Wilcove, D. S. Geographic distribution of endangered species in the United States. *Science* **275,** 550–553 (1997).
11. Reid, W. V. Biodiversity hotspots. *Trends Ecol. Evol.* **13,** 275–280 (1998).
12. Prendergast, J. R., Quinn, R. M., Lawton, J. H., Eversham, B. C. & Gibbons, D. W. Rare species, the coincidence of diversity hotspots and conservation strategies. *Nature* **365,** 335–337 (1993).
13. Williams, P. *et al.* A comparison of richness hotspots, rarity hotspots, and complementary areas for conserving diversity of British birds. *Cons. Biol.* **10,** 155–174 (1996).
14. Vane-Wright, R. I., Humphries, C. J. & Williams, P. H. What to protect?—systematics and the agony of choice. *Biol. Cons.* **55,** 235–254 (1991).
15. Williams, P. H., Humphries, C. J. & Vane-Wright, R. I. Measuring biodiversity: taxonomic relatedness for conservation priorities. *Aust. Syst. Bot.* **4,** 665–679 (1991).
16. Mittermeier, R. A., Myers, N., Gil, P. R. & Mittermeier, C. G. *Hotspots: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions* (Cemex, Conservation International and Agrupacion Sierra Madre, Monterrey, Mexico, 1999).
17. Davis, S., Heywood, V. H. & Hamilton, A. C. (eds) *Centres of Plant Diversity* (three vols) (World Wide Fund for Nature and International Union for Conservation of Nature and Natural Resources, Gland, Switzerland, 1994–1997).
18. Groombridge, B. (ed.) *Global Biodiversity* (Chapman and Hall, London, 1992).
19. Heywood, V. H. (ed.) *Global Biodiversity Assessment* (Cambridge Univ. Press, Cambridge, 1995).
20. Prance, G. T., Beent J. H., Dransfield, J. & Johns, R. *The Tropical Flora Remains Undercollected* (Missouri Botanical Garden Scientific Publications, St. Louis, Missouri, in the press).
21. Nowak, R. *Walker's Mammals of the World* (Johns Hopkins Univ. Press, Baltimore, Maryland, 1999).
22. Sibley, C. G. & Monroe, B. L. *Distribution and Taxonomy of Birds of the World* (Yale Univ. Press, New Haven, Connecticut, 1990).
23. Uetz, P. & Etzold, T. The EMBL/EBI reptile database. *Herpetol. Rev.* **27,** 175 (1996).
24. Glaw, F. & Kohler, J. Amphibian species diversity exceeds that of mammals. *Herpetol. Rev.* **29,** 11–12 (1998).
25. Eschmeyer, W. M. *Catalog of Fishes* (California Academy of Sciences, San Francisco, 1998).
26. Janzen, D. H. How to be a fig. *Annu. Rev. Ecol. Systemat.* **10,** 13–51 (1979).
27. Farrell, B. D. 'Inordinate Fondness' explained: why are there so many beetles? *Science* **281,** 555–557 (1998).
28. Gaston, K. J. Regional numbers of insect and plant species. *Funct. Ecol.* **6,** 243–247 (1991).
29. Strong, D. R., Lawton, J. H. & Southwood, T. R. E. *Insects on Plants: Community Patterns and Mechanisms* (Blackwell, Oxford, 1984).
30. Price, P. W. *Insect Ecology* 3rd edition (Wiley, New York, 1997).
31. Balmford A. & Long, A. Across-country analyses of biodiversity congruence with current conservation efforts in the tropics. *Cons. Biol.* **9,** 1539–1547 (1996).
32. Williams, P. H., Gaston, K. & Humphries, C. J. Mapping biodiversity value worldwide: combining higher-taxon richness from different groups. *Proc. R. Soc. Lond. B* **264,** 141–148 (1997).
33. MacArthur, R. H. & Wilson, E. O. *The Theory of Island Biogeography* (Princeton Univ. Press, Princeton, 1967).
34. Brooks, T. & Balmford, A. Atlantic forest extinctions. *Nature* **380,** 115 (1996).
35. Brooks, T., Pimm, S. L. & Collar, N. J. Deforestation predicts the number of threatened birds in Insular Southeast Asia. *Cons. Biol.* **11,** 382–394 (1997).
36. Brooks, T. M., Pimm, S. L. & Oyugi, J. O. Time lag between deforestation and bird extinction in tropical forest fragments. *Cons. Biol.* **13,** 1140–1150 (1999).
37. Laurance, W. F. Introduction and synthesis. *Biol. Cons.* **91,** 101–107 (1999).
38. Gaston, K. J. & Nicholls, A. O. Probable times to extinction of some rare breeding bird species in the United Kingdom. *Proc. R. Soc. Lond. B* **259,** 119–123 (1995).
39. Turner, I. M. Species loss in fragments of tropical rain forests: a review of the evidence. *J. Appl. Ecol.* **33,** 200–209 (1996).
40. Pimm, S. L. & Askins, R. A. Forest losses predict bird extinctions in Eastern North America. *Proc. Natl Acad. Sci. USA* **92,** 9343–9347 (1995).
41. Cowlinshaw, G. Predicting the pattern of decline of African primate diversity: an extinction debt from historical deforestation. *Cons. Biol.* **13,** 1183–1193 (1999).
42. Newmark, W. D. Insularization of Tanzanian parks and the local extinction of large mammals. *Cons. Biol.* **10,** 1549–1556 (1996).
43. Tilman, D., May, R. M., Lehman, C. L. & Nowak, M. A. Habitat destruction and the extinction debt. *Nature* **371,** 65–66 (1994).
44. Stattersfield, A. J., Crosby, M. J., Long, A. J. & Wege, D. C. *Endemic Bird Areas of the World: Priorities for Biodiversity Conservation* (Birdlife International, Cambridge, UK, 1998).
45. Dinerstein, E. *et al. The Global 200: Key Ecoregions for Saving Life on Earth* (World Wildlife Fund-US, Washington DC, 1996).
46. Mittermeier, R. A., Myers, N., Thomsen, J. B., da Fonseca, G. A. B. & Olivieri, S. Biodiversity hotspots and major tropical wilderness areas: approaches to setting conservation priorities. *Cons. Biol.* **12,** 516–520 (1998).
47. James, A. N., Gaston, K. J. & Balmford, A. Balancing the Earth's accounts. *Nature* **401,** 323–324 (1999).
48. Myers, N. Lifting the veil on perverse subsidies. *Nature* **392,** 327–328 (1999).

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ORIGINAL PAPER

Geographic discrepancies between global and local rarity richness patterns and the implications for conservation

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Abstract The emerging interest in the biological and conservation significance of locally rare species prompts a number of questions about their correspondence with other categories of biodiversity, especially global rarity. Here we present an analysis of the correspondence between the distributions of globally *and* locally rare plants. Using biological hotspots of rarity as our framework, we evaluate the extent to which conservation of globally rare plants will act as a surrogate for conservation of locally rare taxa. Subsequently, we aim to identify gaps between rarity hotspots and protected land to guide conservation planning. We compiled distribution data for globally and locally rare plants from botanically diverse Napa County, California into a geographic information system. We then generated richness maps highlighting hotspots of global and local rarity. Following this, we overlaid the distribution of these hotspots with the distribution of protected lands to identify conservation gaps. Based on occupancy of 1 km^2 grid cells, we found that over half of Napa County is occupied by at least one globally or locally rare plant. Hotspots of global and local rarity occurred in a substantially smaller portion of the county. Of these hotspots, less than 5% were classified as multi-scale hotspots, i.e. they were hotspots of global *and* local rarity. Although, several hotspots corresponded with the 483 km^2 of protected lands in Napa County, some of the richest areas did not. Thus, our results show

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that there are important conservation gaps in Napa County. Furthermore, if only hotspots of global rarity are preserved, only a subset of locally rare plants will be protected. Therefore, conservation of global, local, and multi-scale hotspots needs serious consideration if the goals are to protect a larger variety of biological attributes, prevent extinction, and limit extirpation in Napa County.

Keywords Biodiversity hotspots · Conservation surrogates · Local rarity · Global rarity · Napa county · Rare plant richness

Introduction

Worldwide, conservation of rare and endangered species is an increasingly pressing concern. Identification and prioritization of biological hotspots, i.e. threatened locations with high concentrations of particular organisms or other biological attributes, is a prominent method to address this issue (Myers et al. 2000; Roberts et al. 2002). Given that conservation efforts take place at global, national, sub-national, *and* local jurisdictional levels, incorporation of multiple scales of analysis is necessary to strengthen our understanding of a given area (Poiani et al. 2000; Gärdenfors 2001; Venevsky and Venevskaia 2005; Crain and White 2011). Consequently, there is substantial need for local analyses of globally prioritized regions to accomplish biodiversity conservation goals (Médail and Quézel 1997; Poiani et al. 2000; Harris et al. 2005; Brooks et al. 2006, Murray-Smith et al. 2009).

Although Myers et al. (2000, 2003) identified global hotspots of diversity based in part on global endemics, within individual biodiversity hotspots, several forms of rarity can exist (Rabinowitz 1981; Crain and White 2011). For example, globally rare species, i.e. those that are rare at the global scale, have very narrow ranges, low population numbers, and are often restricted to specific habitats (Rabinowitz 1981). In contrast, locally rare species are those that are rare at a local scale, but more common at the state, national, or global level (Leppig and White 2006; Crain and White 2011). Because of this, locally rare taxa often have a wide global distribution and large overall population numbers despite being sparse at local scales. Moreover, locally rare taxa are often found near major habitat or climate transitions and therefore they frequently occur in a variety of habitats. Consequently, locally rare species are innately different from globally rare species, and may have unique distributions as a result.

Here we conduct a unique analysis of the distribution of global rarity richness in relation to local rarity richness in a regional geographic setting. Thus far, the potential for global rarity hotspots to act as surrogates for locally rarity hotspots has never been tested. Therefore, the primary objectives of this study are to integrate the distributions of globally and locally rare plants identified by NatureServe (2006), and Crain and White (2011), to identify rarity richness hotspots. The subsequent goal is to examine the extent to which globally rare plant richness hotspots correspond with hotspots of local rarity. We specifically test the hypothesis that the distributions of global and local rarity hotspots have limited correspondence largely because of the unique biological and geographical underpinnings responsible for generating these two types of rarity (Mills and Schwartz 2005; Leppig and White 2006; Master et al. 2009). We seek to determine the extent of spatial protection locally rare plant taxa could receive under the umbrella of global rarity conservation efforts. Our final endeavor is to highlight specific locations that deserve

conservation prioritization (i.e. those with high levels of globally and locally rare plants) and the gaps between these hotspots and protected areas.

Research conducted at global, national, and state levels repeatedly highlights the California Floristic Province as a biodiversity hotspot based on a variety of criteria ranging from overall diversity to rarity-weighted richness (Dobson et al. 1997; Abbitt et al. 2000; Myers et al. 2000; Stein et al. 2000). In agreement with similar findings from Médail and Quézel (1997, 1999) and Murray-Smith et al. (2009), research on the California Floristic Province indicates that diversity is not evenly distributed (Parisi 2003). This is largely the result of the geographic complexity of the State of California in general. The result is a region that is rich with globally and locally rare taxa (Parisi 2003; Crain and White 2011; CNPS 2011). Therefore, analysis of biodiversity distributions within individual counties of California is invaluable for understanding patterns of global and local rarity richness and for development of conservation strategies within this global biodiversity hotspot.

The present study focuses specifically on Napa County, a highly diverse local subset of the California Floristic Province that has had much of its land converted for agriculture and other human uses (Thorne et al. 2004). Napa County's position along several major environmental transitions has likely contributed to its overall diversity (Hickman 1993). The county has high richness levels for numerous taxonomic groups and contains a disproportionate number of endangered taxa (Stein et al. 2000; Parisi 2003). Floristic studies in particular indicate that Napa is uniquely rich, and numerous globally and locally rare plants occupy the county (Stebbins and Major 1965; CNDDB 2006, 2007; Crain and White 2011), thus making it an ideal location for this analysis.

Methods

Recent assessments indicate that numerous plant taxa distributed in Napa County are considered rare at the global and/or state geographic assessment level (G-rank ≤ 3 and/or S-rank ≤ 3, hereafter referred to collectively as globally rare plants) according to criteria outlined by NatureServe's Element Ranking System. These rankings correspond to the critically imperiled, imperiled, or vulnerable categories employed by NatureServe (CNDDB 2006, 2007; Master et al. 2009). Using newly developed L-rank criteria, Crain and White (2011) also identified several locally rare plant taxa distributed within Napa County (taxa with L-ranks 1, 2 or 3). We used ArcGIS 9.1 (ESRI 2005) to map and analyze the distributions of these plants in Napa County. For the 55 globally rare plants and 89 locally rare plants with available geographic information system (GIS) distribution data, we imported vector layers from the California Department of Fish and Game Natural Diversity Database RareFind 3.0.5 computer application (CNDDB 2006, also see Bittman 2001) and raster layers from the CalJep database (Viers et al. 2006) into a new map. We then converted each vector layer to produce new 1 km $\times$ 1 km (1 km^2) raster distribution layers for each rare plant taxon. We reclassified each raster layer with spatial analyst (ESRI 2005) to create new layers with a binary code (1 or 0) indicating presence or absence of the taxa within each 1 km^2 grid cell. Finally, we isolated each plant's distribution in Napa County from its distribution in the rest of the state by applying a Napa County mask layer to each plant distribution layer.

Once completed, we joined the distribution layers of 144 ranked plants (G-, S-, and L-ranks 1, 2 or, 3) in Napa County. The resulting layer showed the distribution of cells in Napa that were occupied by at least one rare taxa of any geographic assessment level; these

cells were classified as plant rarity cells. To generate new layers highlighting rare plant richness hotspots, we used the Raster Calculator in spatial analyst (ESRI 2005) to sum the presence/absence data from the individual plant distribution layers. We summed distribution layers for globally and locally rare taxa individually. In the two resulting rarity richness layers, cells were ranked according to the number of rare taxa/cell. For purposes of reporting results, we defined rarity richness cells as any cell with two or more rare taxa. Following protocols established in two previous hotspot analyses (Prendergast et al. 1993; Williams et al. 1996), we classified the top 5% of cells ranked by species richness (in this case cells with 5 or more globally rare taxa or 20 or more locally rare taxa) as rarity hotspots.

To determine if globally and locally rare plants are protected concurrently, we compared the distribution of global rarity richness with the distribution of local rarity richness to determine the extent of their correspondence. To accomplish this, we generated two new raster layers by reclassifying the richness distribution layers. As before, rarity richness cells in each layer were binary coded (1, 0) to indicate presence or absence, layers were added using the Raster Calculator (ESRI 2005), and a new layer showing the intersection of global *and* local rarity richness cells was created. Cells or clusters of cells with values of two in the new layer were thus classified as multi-scale hotspots of plant rarity richness, defined here as any cell occupied by two or more locally rare plant taxa in addition to two or more globally rare plant taxa.

Finally, we compared the results from our hotspot distribution maps to the distribution of protected lands in Napa County. Data on the distribution of protected lands was available from Napa County Land Trust (NCLT) with permission (NCLT 2006). We overlaid each hotspot layer with the protected lands layer to identify significant rare plant conservation gaps.

Results

Napa County emerged as a region rich in plant rarity, as over 58.0% of the county was occupied by at least one rare plant based on occupancy of 1 km^2 grid cells. Collectively, rare plants occupied 1,191 grid cells out of 2,052 (Fig. 1a). Globally rare plants occupied 37.7% of the county, or 775 cells, and locally rare plants as defined by the L-rank criteria occupied 31.3% of the county, or 644 cells (Fig. 1b, c).

In terms of global rarity, 321 cells, or 15.6% of Napa County, were occupied by two or more globally rare plants and were therefore classified as global rarity richness cells. Of these cells, 50 of them, or 2.4% of the county, were occupied by five or more rare plants, and classified as global rarity hotspots. These cells were distributed in 11 discrete locations that varied in overall size. The very richest cell was occupied by nine globally rare plant taxa and was located in northwest Napa County in the Mount St Helena area (Table 1; Fig. 1b).

In terms of local rarity, 331 grid cells, or 16.1% of Napa County, were occupied by two or more locally rare plants, and were therefore classified as local rarity richness cells. Of these cells, 84 of them, or 4.1% of the county, were occupied by at least 20 ranked plants, and were classified as local rarity richness hotspots. These cells were distributed in 14 different areas that also varied substantially in size. The very richest cell in the county was occupied by 26 locally rare plant taxa and was also located in northwest Napa County in the Mount St. Helena area, corresponding with the peak richness locality for globally rare plants (Table 2; Fig. 1c).

When the distribution of global rarity richness cells (1 km^2 cells) was overlaid with the distribution of local rarity richness cells, 568 grid cells (27.7% of Napa's total) met the definition of rarity richness cells for at least one geographic assessment level (global/sub-national or local). Of these grid cells, 84 (4.1% of Napa's total) met the

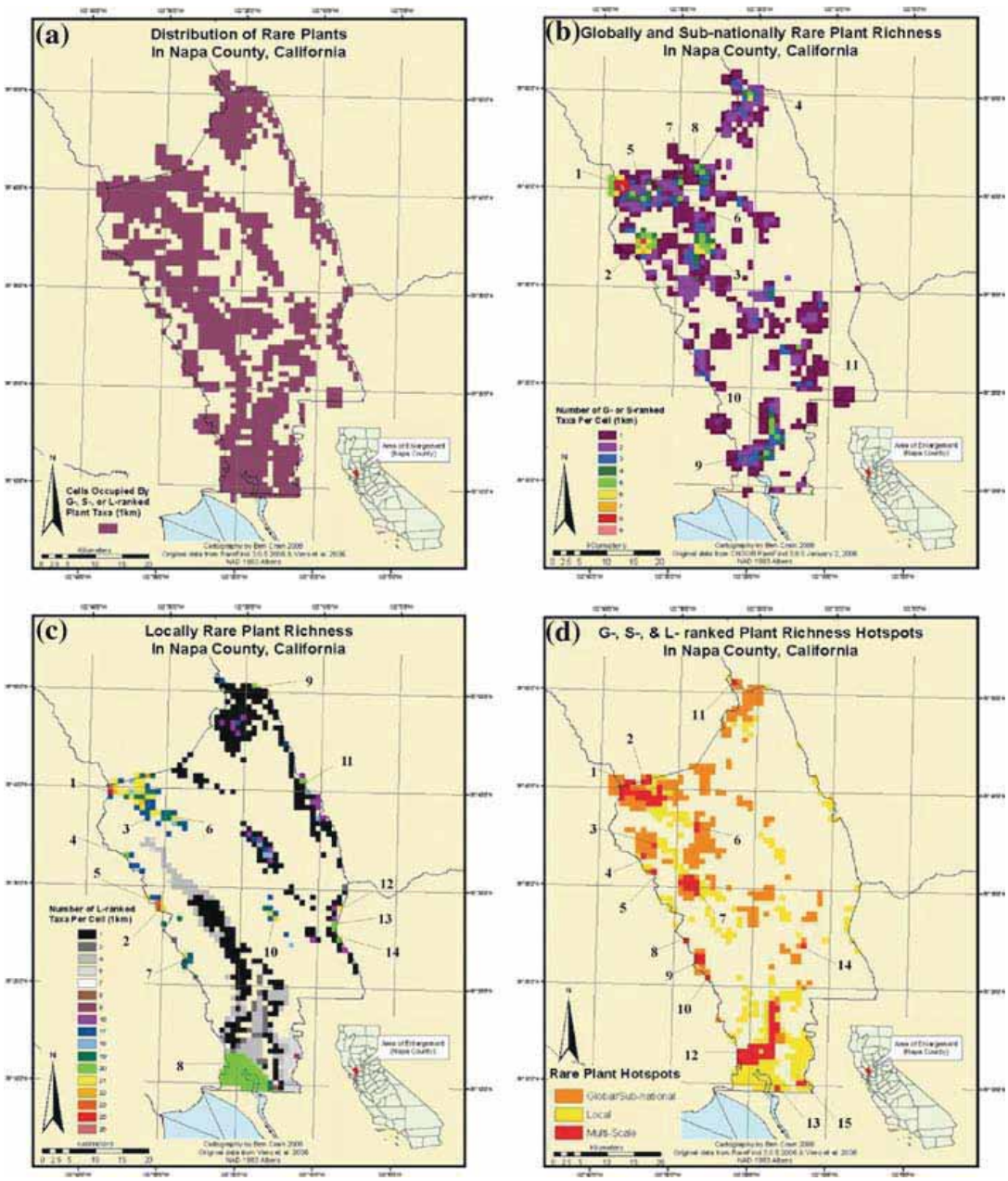

Fig. 1 **a** The distribution of rare plants in Napa County. **b** The distribution of G- and S-ranked plant richness in Napa County. Numbered locations indicate hotspots of global rarity (see Table 1). **c** The distribution of L-ranked plant richness in Napa County. Numbered locations indicate hotspots of local rarity (see Table 2). **d** Global and local rarity richness cells and multi-scale hotspots in Napa County. Numbered locations indicate multi-scale hotspots (see Table 3). All maps are based on occupancy of 1 km^2 grid cells and presented in NAD 1983 Albers projection

criteria for both global *and* local rarity richness cells, and thus, were highlighted as multi-scale hotspots of rare plant richness. Approximately 26.0% of all global rarity richness cells corresponded with local rarity richness cells while 25.0% of all local rarity richness cells corresponded with global rarity richness cells (Fig. 1d). In total, 15 localities in Napa County were classified as multi-scale hotspots (Table 3; Fig. 1d). Locations among the richest hotpots of global *and* local rarity (Tables 1, 2) only corresponded in the Mount St. Helena area.

Table 1 The 11 global rarity hotspots in Napa County, CA

Number	Hotspot location	Area (km^2)
1	Mount St. Helena/Table Mountain area	15
2	Southeast Calistoga area	13
3	Angwin area near Howell Mountain	9
4	Knoxville area near the Yolo County Border	2
5	Area near Table Rock	1
6	Area southwest of Aetna Springs	1
7	Area near James Creek northeast of Aetna Springs	1
8	Area along Butts Canyon	2
9	Area near Cutting Wharf near the Napa River	1
10	Area along the Napa River near Rocktram	4
11	Area near Foss Valley east of Atlas Peak Road	1

Numbers in column one correspond with numbered locations in Fig. 1b

Table 2 The 14 local rarity hotspots in Napa County, CA

Number	Hotspot location	Area (km^2)
1	Mount St. Helena/Sugarloaf Mountain/Table Mountain area	21
2	Sugarloaf Ridge State Park near Bald Mountain and Heath Canyon	3
3	Rattlesnake Ridge area	2
4	South of Calistoga in the Diamond Mountain area	1
5	Area south of Sulfur Canyon	1
6	Three Peaks Area	1
7	Mount Veeder Area	1
8	Southern end of the Napa River and the adjacent sloughs and islands	46
9	Northern Long Canyon area near the Yolo/Napa border	1
10	Atlas Peak area	2
11	Along the Blue Ridge near Green Canyon	1
12	North of Bull Canyon near the Napa/Solano border	1
13	Area near the Blue Ridge Road near the Napa/Solano border	2
14	Vaca Mountains near Mix Canyon Road	1

Numbers in column one correspond with numbered locations in Fig. 1c

Lastly, spatial analyses indicated that although approximately 483 km^2 of land (23% of Napa County) is protected under some level of conservation status (Fig. 2a; NCLT 2006), in some cases, the richest hotspots did not correspond with these protected lands and conservation gaps existed (Fig. 2b). Overall, 63.0% of global rarity richness cells did not correspond with protected land in Napa County. Concerning only the hotspot cells, 78.0% did not correspond with protected land. In general, global rarity richness corresponded best with protected lands in extreme northern Napa County. The global rarity hotspot in the Knoxville area and several other smaller yet significant areas corresponded well with protected lands in this portion of the county. Other significant locations that corresponded

Table 3 The 15 multi-scale hotspots in Napa County, CA

Number	Hotspot location	Area (km^2)
1	Mount St. Helena/Sugarloaf Mountain area	22
2	Three Peaks area	3
3	East Calistoga in the north end of Napa Valley	1
4	South of Calistoga in the Diamond Mountain area	1
5	North of Spring Mountain Road near the Napa/Solano border	1
6	Area north of Angwin	2
7	St. Helena area	10
8	Area near Dry Creek Road on the Napa/Sonoma border	1
9	Mt. Veeder Area	4
10	Area near Devil's Canyon near the Napa/Sonoma border	1
11	Area on the Napa/Yolo border north of Berryessa Road	1
12	Southern end of the Napa River & adjacent sloughs and islands	33
13	Area along American Canyon Creek near the Napa/Solano border	1
14	Milliken Canyon area	1
15	American Canyon area	2

Numbers in column one correspond with numbered locations in Fig. 1d

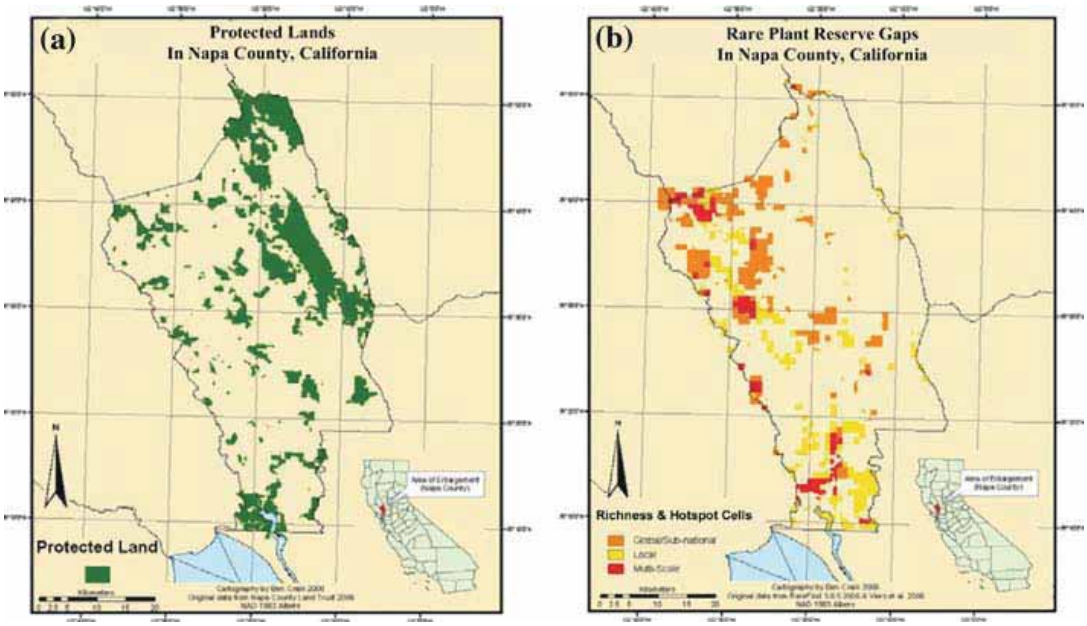

Fig. 2 **a** The distribution of protected lands in Napa County, CA. **b** Rare plant reserve gaps in Napa County. Both maps presented in NAD 1983 Albers projection

to some degree were near the Napa River, the Atlas Peak area, and the Aetna Springs area. On the other hand, the Mount St. Helena and Table Rock area hotspots corresponded with protected lands only to a very limited extent, and some of the richest cells in this area did

not correspond with conservation reserves at all. Furthermore, two of the richest hotspots of global rarity, the areas south of Calistoga and near Angwin, corresponded with protected areas in almost none of their ranges (Figs. 1b; 2a, b).

Local rarity richness corresponded best with protected lands in the southern portion of the county, but again, significant conservation gaps were apparent (Figs. 1c; 2a, b). In total, 50.3% of local rarity richness cells did not correspond with protected land. For example, the majority of local rarity hotspots in the central portion of the county rarely corresponded with protected areas. More surprisingly however, is the finding that 71.4% of the hotspot cells corresponded with reserves. In general, the majority of the south Napa River and adjacent sloughs and islands hotspot corresponded well with protected lands. Additionally, hotspots corresponded relatively well along the eastern border of the county; the Blue Ridge and the Bull Canyon hotspots both corresponded with protected lands to some degree. Conversely, many other hotspots of local rarity, including large portions of the richest ones, did not correspond with protected lands (Figs. 1c; 2a, b).

Finally, 59.6% of multi-scale hotspot cells did not correspond with protected land. Multi-scale hotspots in the southern part of the county corresponded with protected lands relatively well. Some portions of the Mount St. Helena/Sugarloaf Mountain multi-scale hotspot corresponded with protected land, but the richest portions did not. Likewise, the majority of multi-scale hotspots in the western portion of the county did not correspond with protected lands (Figs. 1d; 2a, b).

Discussion

Based on our analysis, globally rare taxa were distributed in approximately 38% of Napa County but global rarity richness cells were distributed in only 15.6% of the county. This is an indication that individual globally rare plant taxa frequently have distributions that are isolated from heterospecifics. As a result, conservation efforts focusing strictly on hotspots may not encompass a majority of rare plant distributions. Nevertheless, the richest global rarity hotspot cells in Napa can be protected in an area covering only 2.4% of the county. Therefore, protecting global rarity hotspots appears to be an effective strategy for preserving several globally rare plants in Napa County, particularly if other conservation strategies are employed as well.

Locally rare plants were distributed in approximately 31.0% of Napa County but local rarity richness cells were distributed in only 16.1% of the county. This suggests that like globally rare plants, the distributions of locally rare plant taxa are often isolated from each other, and again, conservation efforts focusing strictly on hotspots may not encompass a significant portion of locally rare plant distributions. Nevertheless, the richest local rarity hotspot cells in Napa can be protected in an area covering only 4.1% of the county, another realistic conservation goal. In sum, our results indicate that identification and prioritization of local rarity hotspots in Napa can focus conservation efforts and protect many significant plant populations.

Lastly, although a large proportion of Napa County is occupied by rarity richness cells, the total distribution of multi-scale hotspots is relatively limited, and equates to only 4.1% of Napa County. Our results are in agreement with those of Mills and Schwartz (2005) that show the distributions of globally rare and endemic species often differ from suffusively rare species (those which are locally rare but with wide geographic ranges). Thus, conservation programs whose primary goal is to protect multiple scales of plant rarity should emphasize these multi-scale hotspots. Current research suggests that hotspot reserves

should be designed to protect species richness and to include adaptive variability (Smith et al. 2001). Conservation of global, local, and multi-scale hotspots can aid significantly in this endeavor by incorporating a larger variety of biological attributes than contained in global rarity hotspots alone. Conveniently, approximately 26.0% of global hotspots are also multi-scale hotspots, suggesting that protected global rarity hotspots could act as surrogates for locally rare plants and their unique ecological attributes. Therefore, protection of multi-scale hotspots should be considered an important conservation goal.

In sum, the establishment of a variety of protected areas is likely the best solution for conserving rare plants in Napa County. This accomplishment will help protect globally rare plants from extinction while also preventing extirpation of locally rare plants. In the past, protected lands in Napa County have been designated and managed for reasons other than conservation of local rarity. For instance, the Knoxville recreation area corresponds with important rare plant habitats (e.g. serpentine soils), yet the main activities in the area are off road all terrain vehicle driving and hunting (see BLM 2011). In the Napa/Sonoma Marsh, a number of important plants and habitats are distributed; however, most research and management plans focus on bird conservation (see CDFG 2011). Even the protected land encompassing much of the Mt. St. Helena hotspot (i.e. Robert Lewis Stevenson State Park) is more renowned as a California Historical Landmark then as a plant reserve as it functions to protect the site of the famous author's honeymoon cabin (see CSP 2011). Other organizations have worked hard to protect the unique flora of Napa County; the recent creation of the Dunn-Wildlake Ranch preserve is an excellent example of these efforts (NCLT 2011). Nevertheless, conservation of local rarity is rarely a driving force behind most conservation efforts, and hence we argue it should be. As is often the case in conservation planning, globally and locally rare plants will require of a variety of different strategies suited to individual taxa and unique locations for effective protection (Schemske et al. 1994; Wu and Smeins 2000; Draper et al. 2003). Numerous studies have shown that the variable and incongruent distributions of diversity and richness hotspots among biological groups often lead to conflicting conservation priorities (Prendergast et al. 1993; Curnutt et al. 1994). Therefore, hotspots should be prioritized in a manor that best represents richness and diversity of global, sub-national, and local rarity wherever possible.

Finally, we provide some speculation about both the high levels rarity richness found in Napa county, and the partial overlap between the distributions of globally and locally rare plants. To begin, Napa County has very rich set of soil substrates that are heterogeneously distributed in the region (Lambert and Kashiwagi 1978). This contributes to overall plant richness, and thus rarity richness, as the two are substantially correlated (Mills and Schwartz 2005). Of special significance are the serpentine soil endemics that although uncommon globally, are somewhat common in the region. Indeed, over 15% of all endangered plants in California are associated with serpentine substrates and 12.5% are restricted to them (Safford et al. 2005).

In terms of local rarity, we see a different picture. Napa County is geophysically at an important junction of a number of major bioregions in the state (Hickman 1993). Here, the Sacramento Valley, the Coast Ranges, and the San Francisco Bay are either within the County or in very close proximity, and each acts as a significant barrier to north–south or east–west plant migrations. Furthermore, the San Joaquin delta system acts as a partial barrier to some north–south plant migrations creating partial isolation. The degree of isolation is however, very conditioned by climate and no doubt that over the eons, plant distributions have shifted greatly. Thus, we can reason that many locally rare plants are present due to these fluctuating biogeographical conditions. When combined with the high degree of heterogeneity of substrates, these conditions lead to higher rates of local rarity

compared to global rarity. Continued work that focuses on species specific habitat requirements, as well as analyses of phylogenetic relations among rare plants will illuminate the details about the differences, and ultimately to the biological underpinnings of rare plants and their distributions, including hotspots (White 1999, 2004; Mills and Schwartz 2005).

To conclude, this research is intended to facilitate more focused analyses of individual hotspots in Napa County, as well as to promote similar research on globally and locally rare plants in different areas of the California Floristic Province and in other global diversity hotspots. Improved understanding of the distribution of biodiversity is one of the most significant objectives for ecologists and biogeographers alike (Gaston 2000). Both the distribution of organisms and the biological basis for their interactions and range dynamics are crucial for understanding and managing the Earth's biodiversity.

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References

Abbitt R, Scott J, Wilcove D (2000) The geography of vulnerability: incorporating species geography and human development patterns into conservation planning. Biol Conserv 96:169–175

Bittman R (2001) The California natural diversity database: a natural heritage program for rare species and vegetation. Fremontia 29:57–62

Brooks T, Mittermeier R, Da Fonseca G, Gerlach J, Hoffman M, Lamoreaux J, Mittermeier C, Pilgrim J, Rodrigues A (2006) Global biodiversity conservation priorities. Science 313:58–61

Bureau of Land Management (BLM) (2011) Knoxville recreation area. http://www.blm.gov/ca/st/en/fo/ukiah/knoxville.html. Accessed June 2011

California Department of Fish and Game (CDFG) (2011) History of the Napa-Sonoma marshes wildlife area. http://www.dfg.ca.gov/lands/wa/region3/nsmwa/history.html. Accessed June 2011

California Department of Fish and Game, Natural Diversity Database (CNDDB) (2006) CNDDB Rare find 3.0.5 computer application. Biogeographic Data Branch-Department of Fish and Game, Sacramento

California Department of Fish and Game, Natural Diversity Database (CNDDB) (2007) Special vascular plants, bryophytes and lichens list. Biogeographic Data Branch-Department of Fish and Game, Sacramento

California Native Plant Society (CNPS) (2011) Rare plant program: locally rare plants. http://www.cnps.org/cnps/rareplants/locally_rare.php. Accessed March 2011

California State Parks (CSP) (2011) Robert lewis stevenson state park. http://www.parks.ca.gov/?page_id=472. Accessed June 2011

Consortium of California Herbaria (CCH) (2010) http://ucjeps.berkeley.edu/consortium/. Accessed December 2010

Crain B, White J (2011) Categorizing locally rare plant taxa for conservation status. Biodivers Conserv 20:451–463

Curnutt J, Lockwood J, Luh H, Nott P, Russell G (1994) Hotspots and species diversity. Nature 367:326–327

Dobson A, Rodriguez J, Roberts W, Wilcove D (1997) Geographic distribution of endangered species in the United States. Science 275:550–557

Draper D, Rossello-Graell A, Garcia C, Gomes C, Sergio C (2003) Application of GIS in plant conservation programs in Portugal. Biol Conserv 113:337–349

Environmental Systems Research Institute (ESRI) (2005) ArcGIS 9.1. Redlands

Gärdenfors U (2001) Classifying threatened species at national versus global levels. Trends Ecol Evol 16:511–516

Gaston K (2000) Global patterns in biodiversity. Nature 405:220–227

Harris G, Jenkins C, Pimm S (2005) Refining biodiversity conservation priorities. Conserv Biol 19: 1957–1968

Hickman J (1993) The Jepson manual: higher plants of California. University of California Press, Berkeley

Lambert G, Kashiwagi J (1978) Soil survey of Napa County, California. United States Department of Agriculture, Soil Conservation Service. http://www.ca.nrcs.usda.gov/mlra02/napa/. Accessed February 2011

Leppig G, White J (2006) Conservation of peripheral plant populations in California. Madroño 53:264–274

Master L, Faber-Langendoen D, Bittman R, Hammerson G, Heidel B, Nichols J, Ramsay L, Tomaino A (2009) NatureServe conservation status assessments: factors for assessing extinction risk. NatureServe, Arlington

Médail F, Quézel P (1997) Hot-spots analysis for conservation of plant biodiversity in the Mediterranean Basin. Ann Mo Bot Gar 84:112–127

Médail F, Quézel P (1999) Biodiversity hotspots in the Mediterranean Basin: setting global conservation priorities. Conserv Biol 13:1510–1513

Mills M, Schwartz M (2005) Rare plants at the extremes of distribution: broadly and narrowly distributed rare species. Biodivers Conserv 14:1401–1420

Murray-Smith C, Brummitt N, Oliveira-Filho A, Bachman S, Moat J, Nic Lughadha E, Lucas E (2009) Plant diversity hotspots in the Atlantic coastal forests of Brazil. Conserv Biol 23:151–163

Myers N (2003) Biodiversity hotspots revisited. Bioscience 53:916–917

Myers N, Mittermeier R, Mittermeier C, Da Fonseca G, Kent J (2000) Biodiversity hotspots for conservation priorities. Nature 403:853–858

Napa County Land Trust (NCLT) (2006) Napa County protected lands GIS layer Napa CA: available with permission

Napa County Land Trust (NCLT) (2011) Land trust of Napa County announces the culmination of the Napa valley wild! campaign. http://napalandtrust.org/2011/05/landtrustofnapacountyannouncestheculminationofthelandtrustofnapacountya/. Accessed June 2011

NatureServe (2006) NatureServe explorer: an online encyclopedia of life version 6.1. NatureServe, Arlington. http://www.natureserve.org/explorer/ranking.htm. Accessed December 2006

Parisi M (2003) Atlas of the biodiversity of California. California Department of Fish and Game, Sacramento

Poiani K, Richter B, Anderson M, Richter H (2000) Biodiversity conservation at multiple scales: functional sites, landscapes, and networks. Bioscience 50:133–146

Prendergast J, Quinn R, Lawton J, Eversham B, Gibbons D (1993) Rare species, the coincidence of diversity hotspots and conservation strategies. Nature 365:335–337

Rabinowitz D (1981) Seven forms of rarity. In: Synge H (ed) The biological aspects of rare plant conservation. Wiley, New York, pp 205–217

Roberts C et al (2002) Marine biodiversity hotspots and conservation priorities for tropical reefs. Science 295:1280–1284

Safford H, Viers J, Harrison S (2005) Serpentine endemism in the California flora: a database of serpentine affinity. Madroño 52:222–257

Schemske D, Husband B, Ruckelshaus M, Goodwillie C, Parker I, Bishop J (1994) Evaluating approaches to the conservation of rare and endangered plants. Ecology 75:584–606

Smith T, Kark S, Schneider C, Wayne R, Moritz C (2001) Biodiversity hotspots and beyond: the need for preserving environmental transitions. Trends Ecol Evol 16:431

Stebbins G, Major J (1965) Endemism and speciation in the California flora. Ecol Monogr 35:1–35

Stein B, Kutner L, Adams J (2000) Precious heritage: the status of biodiversity in the United States. Oxford University Press, New York

Thorne J, Kennedy J, Quinn J, McCoy M, Keeler-Wolf T, Menke J (2004) A vegetation map of Napa County using the manual of California vegetation classification and its comparison to other digital vegetation maps. Madroño 51:343–363

Venevsky S, Venevskaia I (2005) Hierarchical systematic conservation planning at the national level: identifying national biodiversity hotspots using abiotic factors in Russia. Biol Conserv 124:235–251

Viers J, Thorne J, Quinn J (2006) CalJep: a spatial distribution database of Calflora and Jepson plant species. San Francisco estuary and watershed Science 4. http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1018&context=jmie/sfews

White J (1999) Rarity and the phylogeography of the large-flowered Piptolobi of *Astragalus L. (Fabaceae)*. Doctor of philosophy dissertation, Department of Botany and Plant Pathology, Michigan State University, East Lansing, MI

White J (2004) Range size, error rates, and the geometry of rare species distributions. Proceedings of the 2002 rare plant symposium: the ecology and management of rare plants of northwestern California. California Native Plant Society, Sacramento

Williams P, Gibbons D, Margules C, Rebelo A, Humphries C, Pressey R (1996) A comparison of richness hotspots, rarity hotspots, and complementary areas for conserving diversity of British birds. Conserv Biol 10:155–174

Wu X, Smeins F (2000) Multiple-scale habitat modeling approach for rare plant conservation. Landsc Urban Plan 51:11–28

Attachment 7

The Land Trust of Napa County

The Land Trust of Napa County (LTNC) is a community-based nonprofit organization dedicated to preserving the character of Napa by permanently protecting land. Established in 1976 by seven founding members, today the Land Trust has roughly 2,000 active members and supporters. In its 36-year history, the Land Trust has completed over 150 projects, forever protecting more than 53,000 acres of land – 10% of Napa County.

LTNC Permanent Preserve System

The Dunn-Wildlake and Duff Ranches are two of six permanent preserves owned and stewarded by the Land Trust of Napa County. LTNC's preserves represent a broad spectrum of Napa County's biological, geological and historical features. These lands protect biodiversity and ecological function while providing recreational and educational opportunities.

Dunn Wildlake and Duff Ranch Preserves

The Dunn-Wildlake Ranch and Duff Ranch Preserves (Wildlake-Duff) comprise 4,030 acres at the northern end of Napa Valley in the heart of the Howell Mountains. Wildlake-Duff consists of the 3,030-acre Dunn-Wildlake Ranch and the 1,000-acre Duff Ranch. LTNC undertook a capital campaign to purchase these lands and protect their outstanding botanical and wildlife values in late 2005. LTNC partnered with numerous organizations to raise the necessary funds, including the Cantus Foundation, Gordon & Betty Moore Foundation, David & Lucile Packard Foundation, and California State Coastal Conservancy. Protection of Wildlake-Duff was also made possible by hundreds of individual donations, beginning with a generous contribution from Randy and Lori Dunn.

Photo by Jake Ruygt

Photo by Mike Palladini

Photo by Marissa Carlisle

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Natural History

Overview

The Land Trust of Napa County's Dunn-Wildlake and Duff Preserves (Wildlake-Duff) encompass 4,030 acres of wild open space at the northern end of Napa Valley, in the heart of the Howell Mountains. A number of other protected conservation areas surround Wildlake-Duff, including the 5,273-acre Robert Louis Stevenson State Park, bringing the entire assemblage to over 12,000 acres. This regionally significant natural area stretches more than 15 contiguous miles from the community of Angwin to Mount St. Helena.

Varying topography and elevation, riparian areas and wetlands, mixed soil types and geology, and a location on the eastern edge of the North Coast Ranges contribute to the rich plant and animal diversity found here. Wildlake-Duff supports a number of organisms and habitat types occurring at their geographic extremes. For example, the coast redwood stands on the eastern edge of the Wildlake property are among the inland-most redwoods in California.

In addition to protecting natural diversity, these lands play an important role in maintaining healthy ecosystems. Wildlake protects the headwaters of Bell Canyon Creek, a year-round tributary of the Napa River which serves as the primary municipal water supply for the City of St. Helena.

Botanical Resources

Wildlake-Duff supports an important segment of the flora of the California North Coast Range Bioregion. Eleven distinct habitat types are found here, including Douglas fir and canyon live oak forest, Oregon oak and McNab cypress woodland, and chamise chaparral. More than 360 native plant species have been recorded within these habitats. Several of these species are listed as rare, threatened or endangered. These include the colorful Cobb Mountain lupine (*Lupinus sericatus*) and elegant St. Helena fawn lily (*Erythronium helenae*).

In addition to the native flora, more than 50 exotic plant species have been introduced to the Preserves through human activity. Several of these species are highly invasive, outcompeting and displacing native plants. These include yellow star thistle, Harding grass, French broom, and Himalayan blackberry. Dedicated volunteers and Land Trust staff are actively working to control invasive species and restore native plant communities on the Preserves.

Wildlife Resources

The diverse mix of habitats within the Dunn-Wildlake and Duff Ranch Preserves support a broad array of wildlife species. Mammals observed include black bear, mountain lion, bobcat, gray fox, coyote, mule deer, and black-tailed jackrabbit. Over 50 breeding bird species have been documented on Wildlake-Duff. These include a number of long distance migrants such as Cassin's vireo, western tanager, and black-throated gray warbler. Bell Canyon Creek provides habitat for a number of reptile and amphibian species, including the pacific giant salamander, rough-skinned newt and northwestern pond turtle. The Preserves also protect habitat for special status wildlife such as the northern spotted owl and ring-tailed cat.

Photo by Jake Ruygt

bitter root, *Lewisia rediviva*

Photo by Dave McMullen

Wilson's warbler, *Cardellina pusilla*

Photo by Mike Paladini

blue oaks, *Quercus douglasii*

Photo by Jeff Alnutez

Monterey ensatina, *Ensatina eschscholtzii eschscholtzii*

Attachment 8

View of Davis development area and Bell Canyon looking south from Three Peaks on the Dunn-Wildlake Preserve. Note that this wild and scenic area is characterized by intact, native-dominated plant communities

View of shared Davis-Dunn-Wildlake Preserve forest block (outlined in red), including areas slated for vineyard conversion. Note distinctness of this habitat feature on the landscape, and the prevalence of intact, native-dominated plant communities in the surrounding area

Immediate approach to the Dunn-Wildlake Preserve trailhead area along Friesen Drive as seen by preserve visitors. Note prominence of intact, native-dominated habitat along roadsides. All of the habitat shown to the left and right of the road out to the full extent of the photograph will be removed to install Davis vineyard blocks A, B and C

Shared Dunn-Wildlake-Davis forested area looking east toward Vineyard Block C. Note clear dominance of ponderosa pine in the forest overstory. Ponderosa pine forest is considered a sensitive biotic community in Napa County, as it covers less than 0.5% of the county's land area and is nearly restricted to Howell Mountain

Dunn-Wildlake Preserve trailhead entrance with proposed Vineyard Block A shown in immediate background. Most preserve visitors enter at this point

Black bear documented in ponderosa pine-dominated forest on the Dunn-Wildlake Preserve boundary immediately adjacent to the proposed Davis Vineyard Block C. Photo was taken on 24 September, 2015. The DEIR does not adequately consider the potential for bear-human conflict and resulting bear mortality associated with the vineyard development

One lane bridge over portion of Friesen Lakes along Friesen drive with unprotected drop-off to water on either edge

Typical one lane, gravel section of Friesen Drive along approach to Davis project area and Dunn-Wildlake Preserve entrance. This section contains several blind turns

Attachment 9

Proposed Davis Family Estates vineyard development area proximity to LTNC Dunn-Wildlake Preserve trailhead and Falimly Loop Trail

0 50 100 Meters

Attachment 10

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Experimenting With Vine Stress

Zaca Mesa replants old vineyard with tighter spacing and own-rooted cuttings

by Andrew Adams

Central Coast winery Zaca Mesa planted a new vineyard with tighter rows and closer spacing in an attempt to produce fruit similar to a neighboring vineyard that is 34 years old.

Los Olivos, Calif.—The production team at Zaca Mesa Vineyard & Winery is looking for the concentrated flavors of an old vineyard by experimenting with ways to plant a new vineyard.

Zaca Mesa's estate vineyard Black Bear block is comprised of own-rooted Syrah vines from Chapoutier in the Hermitage region of the Northern Rhone Valley. Eric Mohseni, winemaker at Zaca Mesa, said the 34-year-old vines could be the oldest in the Central Coast. "It's always been pretty amazing fruit," he said.

In the hope of recreating some of the power of Black Bear, Mohseni said he is experimenting with planting on own-rooted cuttings from the old vineyard as well as adopting tighter spacing and low-to-ground 20" trellis wire. "We thought it would be pretty neat to try something like this," he said.

The new planting (dubbed Mesa C) is 18 acres, of which nearly 7.5 acres are planted with "artisanal" clones on their own rootstock, and a little more than 3 acres are planted in tight rows and with low trellis wire.

Fostering vine competition

Mohseni said the idea is to see if the tight rows and low trellis wire will help younger vines yield the concentrated flavors and solid, well-integrated tannin structure that he finds in the Black Bear block. "There's natural competition, so the vines are really going to struggle," Mohseni said. "There's less fruit per vine, and I think you're going to have deeper concentration."

Mohseni planted with a mix of clones in the rest of the vineyard to achieve vine diversity. He said he expects to bottle wine from the new vineyard after the 2015 harvest. "I believe that this block will be the pinnacle for Zaca Mesa and will produce some of the best Syrah in the Santa Ynez Valley," he said.

The Black Bear Syrah is Zaca Mesa's most expensive offering, listed for $60 on the winery's website. Zaca Mesa produces 30,000 cases per year, according to WinesVinesDATA. All the wines under the Zaca Mesa label are produced from the winery's 244 acres of estate vines in the Santa Ynez Valley AVA.

Mohseni said vineyards and especially Syrah vines have suffered in parts of California, as growers have been quick to pull out vines or graft on whatever happens to be popular. Only a few vineyards, like the Black Bear block, have the history to show what the vines can yield when they mature, he said.

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August 2015	$608 million		$8,178 million	
August 2014	$568 million	7%	$7,729 million	6%

Direct-to-Consumer Shipments »	Month		12 Months	
August 2015	$80 million		$1,908 million	
August 2014	$78 million	2%	$1,686 million	13%

Winery Job Index »	Month		12 Months	
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August 2014	218	20%	224	19%

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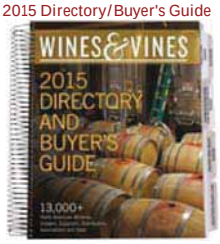

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The original vines are still virus-free, and Mohseni said it will be interesting to see if the vineyard site and tight 6-by-4 spacing will yield the concentrated flavors and lower alcohol levels similar to the Black Bear block.

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Posted on 07.12.2012 - 22:15:36 PST

Wow, positive attitude. I work with a 16 year old block of suitcase Syrah on own root, in Paso Robles that continues to improve in quality and health. I see a lot of potential and far less financial pitfalls in own root in this particular area. You may have a lot of difficulty in your particular region with it, but don't think you have all regions figured out. If you can pull off own root, I think it is the best expression of the clone. Open your mind.

Durn

Posted on 07.14.2012 - 08:49:54 PST

I agree with Jim. Phylloxera is found nearly everywhere. Unless you are in some isolated uninhabited island or clearly outside the natural surviving conditions of Phyloxxera, forget it. This seems to me to be the dream of someone that has no feet in reality. The vineyard will either be unsustainable soon, or they will be soaking it with Assail or other anti-phylloxera insecticides. This is not the vision I have of high dollar wine. It is hardly being in commune with nature and working with it.

Yanosh

Posted on 07.26.2012 - 19:23:35 PST

Yanosh is exaggerating a bit. It is not common in South America, and I manage a Cabernet Sauvignon vineyard in the mountains of West Texas that has been productive on its own roots since 1987. I planted another 11 acres of vinifera nearby this year, and I am confident that there is no phylloxera in the area or I would not have done it. Grafted vines are a blessing where phylloxera exists, but a burden in areas with harsh winters and frequent drought. If you don't need to graft, why do it?

Adam White

Posted on 07.11.2012 - 08:48:54 PST

Sounds like an ideal way to disseminate grapevine leafroll virus.

New York Viticulture

Posted on 07.11.2012 - 19:45:56 PST

Phylloxera was spread from North America to Europe, and South Africa, and South America and to New Zealand and Australia. Believe me, it will surely move from wherever it is now - most probably in winery's own blocks - to this ungrafted vineyard with great ease. Phylloxera moves on equipment such as backhoes and harvesters, on hand crews' clothing and boots, and (some evidence) on the wind. You can predict that it will be found on roots by the 6th leaf, show declining vines by year 8 and be a totally non-economic vineyard by year 10 or 12.

Jim W

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Attachment 11

Fairfax Conversion Project

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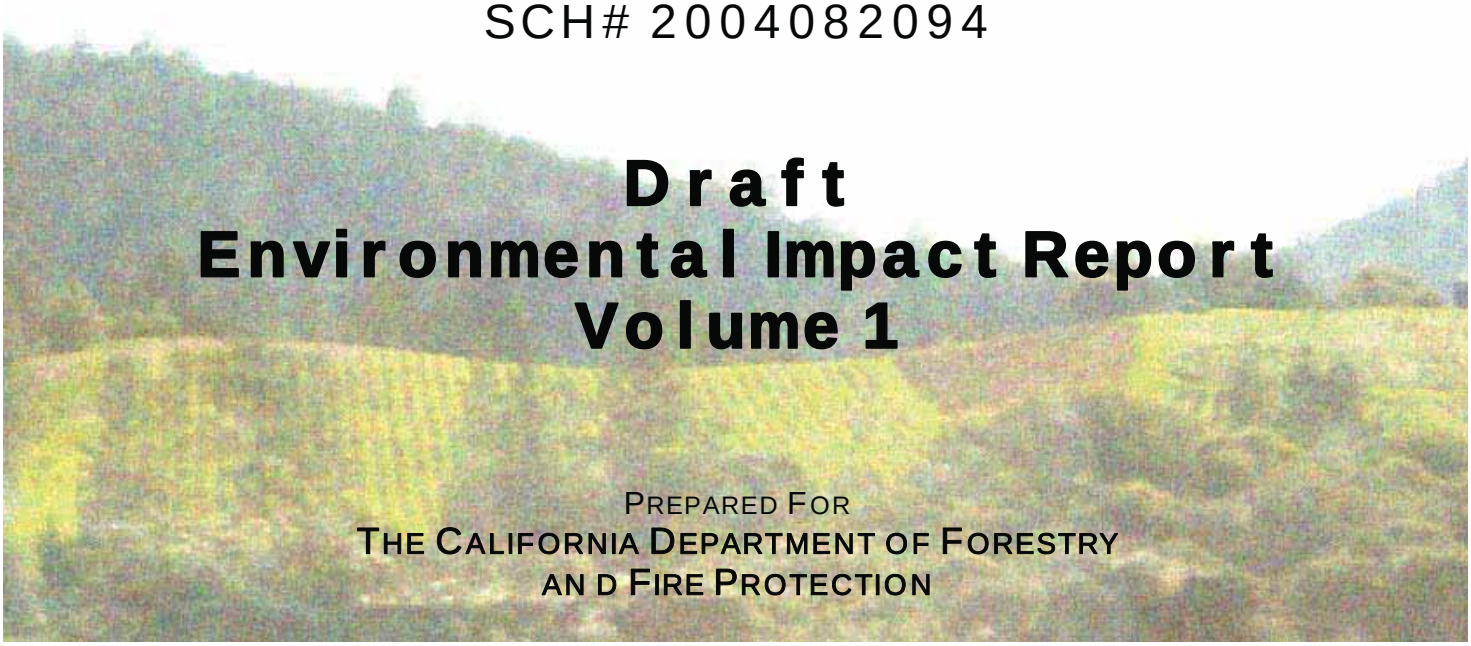

Draft Environmental Impact Report Volume 1

PREPARED FOR
THE CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

JUNE 2009

Prepared by
RANEY PLANNING & MANAGEMENT, INC.

RANEY PLANNING & MANAGEMENT, INC.
1501 Sports Drive, Sacramento, CA 95834

Fish Friendly Farming

In addition to the use of IPM, the Fairfax vineyard would be enrolled in the Fish Friendly Farming Program[6] and the California Association of Winegrape Growers Sustainable Winegrowing Program.[7] Other Artesa vineyards already participate in the Sustainable Winegrowing Program. One of the primary goals of the Fish Friendly Farms program is to limit chemical use in order to reduce impacts on fish species. Chemical use is reduced through the implementation of Beneficial Management Practices.

Conclusion

Through the applicant's use of IPM practices and compliance with all current pesticide and herbicide application regulations, the risk to people or biological resources from the application of agricultural chemicals during vineyard operations would not be adverse. However, should an accident cause the unregulated release of agricultural chemicals into the environment a ***potentially significant*** impact could occur.

Mitigation Measure(s)
Implementation of the following mitigation measure would mitigate potential impacts to a *less-than-significant* level:

3.8-4 Implement Mitigation Measure 3.7-4.

3.8-5 Impacts from wildfire hazards.

As shown in Figure 3.8-1, the project site is located within an area with moderate or high potential for large wildland fires. The terrain around Annapolis is rugged, with steep slopes below the semi-level ridgetop. The area is heavily vegetated with timber, grassland, and chaparral, and summer and fall climatic conditions are warm and dry. As such, the area has been identified as having a seasonal moderate to high fire hazard. Therefore, the possibility exists for wildland fires to have an adverse effect on the project site. The site is considered to be wildland, and CAL FIRE is the agency responsible for fire suppression.

Following the timber harvest, any remaining woody material not suitable for commercial use would be piled and/or chipped onsite. During vineyard operations all pruned vegetation would be chipped and spread as mulch, and burning would not occur. Therefore, although the project would not be expected to result in an adverse impact related to the creation of fires, because the project site is identified by CAL FIRE as a moderate to high fire hazard area, the impact of wildland fire on the proposed project, including employees associated with the project, would be considered ***potentially significant***.

Figure 3.11-7
Aerial of Adjacent Residences

Mitigation Measure(s)
None required.

3.11-4 Impacts associated with light and glare from the proposed project.

The project site is currently undeveloped and consists of coniferous forest interspersed with grasslands and the remnants of previous agricultural uses. As such, the site currently does not produce any light or glare. While the proposed project would result in the construction of a small corporation yard on 1-acre south of Annapolis Road, the applicant has stated that the corporation yard would not be lighted at night. The yard will be equipped with motion-activated lights as a theft-deterrent. However, the only times the lights would actually be turned on at night for an extended period of time are (1) when the vineyard crew needs to prepare the tractors for nighttime operations, and (2) a few days during harvest should the crew need to start picking grapes early. In general, grape harvesting activities associated with the proposed project could result in the generation of light at night during harvesting season. Grape harvesting may take place by mechanical means during the night and early morning hours. Although the applicant has indicated that floodlights would not be used during harvest season, the harvesting machinery itself contains lights (headlights and other lights), which would create new sources of light and glare on the project site. Depending upon

the location of the harvesting operations, nearby residents could be subject to light and glare from the machinery. However, given the varied topography of the project site and the incorporation of approximately 133 acres of streamside buffers throughout the project site, much of the harvest machinery lighting would not be observable to residents in the site vicinity.

The applicant proposes to utilize reflective bird control ribbon, composed of Mylar® or a similar material, among the vine rows as a deterrent to birds which would otherwise feed on the grapes. Shiny, highly reflective ribbon-like tape is widely used in vineyards to deter birds from landing on the vines. The applicant proposes to use one-inch wide, six- to twelve-inch long strips of bird control ribbon on the vineyards on an as-needed basis to repel nuisance birds. The ribbon would generate small amounts of light and glare visible to adjacent residents and drivers on Annapolis Road.

Night and early morning light generation associated with grape harvesting activities would be of a seasonal nature, occurring only two months out of the year; and the lights would be concentrated in only a small area of the site at any given time. As a result, the proposed project would have a ***less-than-significant*** impact regarding light and glare.

Mitigation Measure(s)
None required.

3.11-5 Consistency of the proposed project's appearance with the surrounding scenery.

As shown in Figures 4.11-3 to 4.11-7, the project site is currently surrounded by timberland, residences, a monastery, a cemetery, and existing vineyards to the east and northeast. Although implementation of the proposed project would result in the conversion of existing timberland and grassland to a vineyard, because the project site is located adjacent to existing vineyards and because other vineyards exist in the vicinity, the conversion of the project site to a vineyard would not be inconsistent with the surrounding scenery. Therefore, the impact would be considered ***less-than-significant***.

Mitigation Measure(s)
None required.

Cumulative Impacts

Cumulative impacts to Aesthetics are analyzed in Impact Statement 4-13 of Chapter 4, Cumulative Impacts.

Attachment 12

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California vineyards find night harvests yield benefits

By Elizabeth Weise, USA TODAY

Updated 11/19/2011 7:22 PM

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NAPA, Calif. – At 4 o'clock in the morning, Shafer Vineyards is alive with light and motion. The sun won't be up for more than three hours, but lines of pickers are moving methodically down vines full of ripe cabernet sauvignon grapes. They're lit by huge bright lights mounted on tractors trundling alongside.

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The scene at this vineyard is part of a worldwide practice that's increasingly the way all wine grapes are harvested — in the dead of night. It results in better wine, lower energy costs and happier workers.

Daytime temperatures in the 90s and above change the sugar composition of grapes. Picking at night when sugar levels are stable keeps "surprises" from happening during fermentation such as wild yeast starting fermentation, says Shafer's Andy Demsky.

PHOTOS: Nighttime grape harvesting

Pickers can work longer hours in the lower temperatures and also avoid the "wasps, bees and rattlesnakes" that come out during the day, he says. And the grapes are picked cool, saving energy because they don't have to be pre-chilled before they're crushed.

Harvesting grapes at night is common worldwide, says Gregory Jones, a viticulture expert at Southern Oregon University in Ashland.

By Jack Gruber, USA TODAY

Hot daytime temperatures change the sugar composition of grapes. Picking at night, when sugar levels are stable, keeps "surprises" from happening during fermentation, says Shafer's Andy Demsky.

"I have seen night harvests in South Africa, Australia, Argentina, Chile, Europe … you name it.

California produces 90% of U.S.-made wines and holds a 61% share of the U.S. wine market, according to the Wine Institute, and about two-thirds of those are from grapes harvested at night, says Nat DiBuduo, president of Allied Grape Growers, a California winegrape marketing cooperative.

It's better for the workers, DiBuduo says. "I don't want to be harvesting food out there at temperatures where it's not safe for the people," he says.

At Shafer Vineyards, president Doug Shafer is out in the 8-acre field being picked this early October morning, watching over the process that's the culmination of a year's growth.

"We'll get 30 tons of grapes" in tonight, he says, consulting with Alfonso Zamora-Ortiz, the vineyard's director of operations.

"In the old days, by 1 o'clock in the afternoon the guys would say 'We're done, we're fried, we can't pick any more.' When they pick at night they can pick more because it's cool, " Shafer says.

In the pre-dawn cold the hired crew of veteran harvesters moves quickly down long rows of carefully pruned

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grapevines, following a light tractor and a half-ton bin. Their harvest knives flash under the lights as a slight flick of the wrist cuts off each bunch of grapes. They drop them into the white plastic bins at their feet, which they kick along at the roots of the vines as they move down the row.

During breaks the men and a few women on the crew pull out tiny whetstones. The snick-snick of their blades being sharpened is the only sound beyond muted conversations in Spanish across the rows.

"Night time is better. It's too hot in the day, you're sweating," says Roberto Flores, one of the pickers. "Starting at 4 a.m. is good. We get seven hours sleep at night."

At Ridge Vineyards in Cupertino, Calif., David Gates, vice president of vineyard operations, says they do night harvests when daytime temperatures get up over 100 degrees. "Then the fruit can get as hot as 110, and you want it at 55."

Ordinarily to bring down the temperature "you run it through a cold bath or a heat exchanger, or big wineries have jackets on their stainless steel tanks," but that all takes energy.

Statewide, during crush California's 3,364 wineries are rushing to turn the ripe fruit into a slurry that's pumped into 4,000 gallon steel tanks for the first round of fermentation. The energy savings from not having to cool 3.99 million tons of that slurry is enormous, though no exact figures are available, says Allison Jordan of the California Sustainable Wine Growing Alliance.

Cool fruit also means better control, and winemakers want total control.

"Chilling the grapes gives the winemaker better control over the fermentation process, says Mark Matthews, a professor of viticulture and enology at the University of California-Davis.

Night harvesting got its start as early as 1970 or 1971, when the first mechanical grape harvesters began to be used in the San Joaquin Valley in California and in New York state's wine growing areas, says Phil Scott, owner of Ag-Right Enterprises in Madera, Calif. The company makes grape harvesters.

Machines didn't care if they worked night or day.

Gates of Ridge Vineyards remembers working with jury-rigged lights in "1982 or 1983" when he was at R.H. Phillips Winery. "We ended up with a little generator on a half-ton bin tractor and some standard 8-foot fluorescent lights up above and underneath."

Today people just rent the same kind of diesel-powered light towers on trailers that roadwork crews use, which typically carry four 1,000 watt lights. Though even that's changing, Gates says. He's seen some vineyards where they "don't even use lights, they just have head lamps on the guys' heads."

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Attachment 13

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Issues in Ecology

TECHNICAL REPORT

BIOTIC INVASIONS: CAUSES, EPIDEMIOLOGY, GLOBAL CONSEQUENCES, AND CONTROL

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Abstract. Biotic invaders are species that establish a new range in which they proliferate, spread, and persist to the detriment of the environment. They are the most important ecological outcomes from the unprecedented alterations in the distribution of the earth's biota brought about largely through human transport and commerce. In a world without borders, few if any areas remain sheltered from these immigrations.

The fate of immigrants is decidedly mixed. Few survive the hazards of chronic and stochastic forces, and only a small fraction become naturalized. In turn, some naturalized species do become invasive. There are several potential reasons why some immigrant species prosper: some escape from the constraints of their native predators or parasites; others are aided by human-caused disturbance that disrupts native communities. Ironically, many biotic invasions are apparently facilitated by cultivation and husbandry, unintentional actions that foster immigrant populations until they are self-perpetuating and uncontrollable. Whatever the cause, biotic invaders can in many cases inflict enormous environmental damage: (1) Animal invaders can cause extinctions of vulnerable native species through predation, grazing, competition, and habitat alteration. (2) Plant invaders can completely alter the fire regime, nutrient cycling, hydrology, and energy budgets in a native ecosystem and can greatly diminish the abundance or survival of native species. (3) In agriculture, the principal pests of temperate crops are nonindigenous, and the combined expenses of pest control and crop losses constitute an onerous ''tax'' on food, fiber, and forage production. (4) The global cost of virulent plant and animal diseases caused by parasites transported to new ranges and presented with susceptible new hosts is currently incalculable.

Identifying future invaders and taking effective steps to prevent their dispersal and establishment constitutes an enormous challenge to both conservation and international commerce. Detection and management when exclusion fails have proved daunting for varied reasons: (1) Efforts to identify general attributes of future invaders have often been inconclusive. (2) Predicting susceptible locales for future invasions seems even more problematic, given the enormous differences in the rates of arrival among potential invaders. (3) Eradication of an established invader is rare, and control efforts vary enormously in their efficacy. Successful control, however, depends more on commitment and continuing diligence than on the efficacy of specific tools themselves. (4) Control of biotic invasions is most effective when it employs a long-term, ecosystem-wide strategy rather than a tactical approach focused on battling individual invaders. (5) Prevention of invasions is much less costly than post-entry control. Revamping national and international quarantine laws by adopting a ''guilty until proven innocent'' approach would be a productive first step.

Failure to address the issue of biotic invasions could effectively result in severe global consequences, including wholesale loss of agricultural, forestry, and fishery resources in some regions, disruption of the ecological processes that supply natural services on which human enterprise depends, and the creation of homogeneous, impoverished ecosystems composed of cosmopolitan species. Given their current scale, biotic invasions have taken their place alongside human-driven atmospheric and oceanic alterations as major agents of global change. Left unchecked, they will influence these other forces in profound but still unpredictable ways.

Key words: alien species; biological control; biotic invaders; eradication; global change; immigration; invasion; naturalization; nonindigenous; pests; weeds.

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Introduction

Biotic invasions can occur when organisms are transported to new, often distant, ranges where their descendants proliferate, spread, and persist (sensu Elton 1958). In a strict sense, invasions are neither novel nor exclusively human-driven phenomena. But the geographic scope, frequency, and the number of species involved have grown enormously as a direct consequence of expanding transport and commerce (Wells et al. 1986, di Castri 1989). Few habitats on earth remain free of species introduced by humans (e.g., Surtsey [Fridriksson and Magnusson 1992]); far fewer are so remote or display such unique environments that they can be considered immune from this dispersal (e.g., locales above 80° latitude). The number of species that have entered new ranges through human agency has increased by orders of magnitude in the past 500 years, and especially in the past 200 years (di Castri 1989), thanks to expanding human migrations and commerce. Nonindigenous species represent an array of taxonomic categories and geographic origins that defy any ready classification (Crawley 1987, Long 1981, Holm et al. 1997).

The adverse consequences of biotic invasions vary enormously. At one extreme, the mere presence of nonindigenous species in a conservation reserve could be deemed detrimental. Invaders can alter fundamental ecological properties such as the dominant species in a community and an ecosystem's physical features, nutrient cycling, and plant productivity (Bertness 1984, Vitousek 1990). The aggregate effects of human-caused invasions threaten efforts to conserve biodiversity (Walker and Steffen 1997), maintain productive agricultural systems (U.S. Congress 1993), sustain functioning natural ecosystems (D'Antonio and Vitousek 1992, Vitousek et al. 1996), and also protect human health (Soulé 1992). However, as a practical rather than conceptual restriction, we do not deal here with the invasive parasites of humans. We outline below the epidemiology of invasions, hypotheses on the causes of invasions, the environmental and economic toll they take, and tools and strategies for reducing this toll.

The Epidemiology of Invasions

Biotic invasions constitute only one outcome—indeed, the least likely outcome—of a multistage process that begins when organisms are transported from their native ranges to new locales. These immigrant organisms and their descendants have been referred to as ''alien,'' ''adventive,'' ''exotic,'' ''neophytes'' (in the case of plants),''introduced,'' and most recently, ''nonindigenous'' (Salisbury 1961, Mack 1985, Baker 1986, U.S. Congress 1993). These terms have been used interchangeably and often without careful distinction. We will employ ''nonindigenous'' as the most general term for immigrant species, especially where their invasive status is uncertain.

The fates of these organisms vary vastly. First, many, if not most, perish en route to a new locale (e.g., propagules suspended in marine ballast water). If they succeed in reaching a new site, immigrants are likely to be destroyed quickly by a multitude of physical or biotic agents (Kruger et al. 1986, Mack 1995). It is almost impossible to obtain data quantifying the number of species that are actually dispersed from their native ranges, the number of emigrants that subsequently perish, and the number of arrivals. But based on the number of species that have been collected only once far beyond their native range (e.g., Thellung 1911–1912, Ridley 1930, Carlton and Geller 1993), the local extinction of immigrants soon after their arrival must be enormous.

Despite such wholesale destruction either in transit or soon after arrival, immigrants occasionally survive to reproduce. Even then, their descendants may survive for only a few generations before going extinct locally. Again, however, some small fraction of these immigrant species do persist and become naturalized. At that point, their persistence does not depend on recurring, frequent re-immigration from the native range (Lousley 1953). These populations' minimum size, number, and areal extent have no commonly identified thresholds, although a greater number and frequency of new arrivals do raise the probability that a species will establish permanently (Veltman et al. 1996). Among the naturalized species that persist after this extremely severe reductive process, a few will go on to become invaders.

A comparison is often made between epidemics caused by parasites and all other biotic invasions because many important factors in disease epidemiology are common to all invasions. These factors include identity of the vectors, the parasite's minimum viable population size, the time course and character of its population growth and spread, the fate of interacting species in the new range (including their coevolution), and mitigating (or exacerbating) effects of the new environment. All have direct parallels in studying invasions, regardless of the species (Mack 1985). Below we explore the epidemiology and the underlying mechanisms that allow some species to become invaders.

Humans as dispersal agents of potential invaders

Humans have served as both accidental and deliberate dispersal agents for millennia, and the dramatic increase in plant, animal, and microbial immigrations worldwide roughly tracks the rise in human transport and commerce (di Castri 1989, U.S. Congress 1993). Ancient human migrations and trade led to the early spread of some domesticated species such as cereals, dates, rice, cattle, and fowl, along with the inadvertent spread of their parasites (diCastri 1989, Zohary and Hopf 1993). Beginning around 1500, Europeans transported Old World species to their new settlements in

the Western Hemisphere and elsewhere. The manifests from Columbus' second and subsequent voyages, for instance, indicate deliberate transport of species regarded as potential crops and livestock (Crosby 1972). Global commerce has grown meteorically since the late 15th century, as indexed by the rise in shipping tonnage (Fayle 1933); this growth has provided an opportunity for a corresponding growth in biotic invasions. Given the magnitude of this transport and subsequent naturalizations of species in new lands, biotic invasions can be viewed as predominantly post-Columbian events.

The human-driven movement of organisms over the past 200 to 500 years, deliberate and accidental, undoubtedly dwarfs in scope, frequency, and impact the movement of organisms by natural forces in any 500-year period in the earth's history. Such massive alteration in species' ranges rivals the changes wrought by continental glaciation and deglaciation cycles of past ice ages, despite the fact that these human-driven range shifts have occurred over much less time (e.g., Semken 1983).

The proportion of various types of organisms that have invaded as a result of accidental vs. deliberate movement clearly varies among taxonomic groups (Moyle 1986, Heywood 1989). Few, if any, invasive microorganisms have been deliberately introduced. Deliberate microbial introductions have instead most commonly involved yeasts for fermentation or mutualists, such as mycorrhizal fungi (Read et al. 1992). Among insects, some deliberate introductions have had adverse consequences, including bumble bees in New Zealand (Thompson 1922), but the majority of invasive insects have probably been accidentally introduced. Introductions of marine invertebrates probably mirror insects. A few deliberate introductions have been made (e.g., the Pacific oyster [*Crassostrea gigas*] imported from Japan to Washington State), but a growing number of invaders such as the zebra mussel (*Dreissena polymorpha*) have arrived as accidental contaminants in ship ballast (Carlton and Geller 1993). In contrast, most invasive vertebrates, principally fish, mammals, and birds, have been deliberately introduced. Some of the worst vertebrate invaders, however, have been spread accidentally: *Rattus rattus, Rattus norvegicus,* the brown tree snake (*Boiga irregularis*), the sea lamprey (*Petromyzon marinus*) (Brown 1989). Some invasive plants have been accidentally introduced as contaminants among crop seeds and other cargo (e.g., *Parthenium hysterophorus, Rottboellia cochinchinensis*) (Huelma et al. 1996). However, many, if not most, plant invaders in the United States have been deliberately introduced, including some of the worst pests: *Eichhornia crassipes, Sorghum halapense, Melaleuca quinquenervia,* and *Tamarix* spp. (R. N. Mack, *unpublished data*).

The prominence of deliberately introduced species that later become biotic invaders emphasizes that not all pests arrive unheralded and inconspicuously; many are the product of deliberate but disastrously flawed human forethought (Fig. 1).

The transformation from immigrant to invader

The progression from immigrant to invader often involves a delay or lag phase, followed by a phase of rapid exponential increase that continues until the species reaches the bounds of its new range and its population growth rate slackens (Mack 1985, Cousens and Mortimer 1995; Fig. 2). This simplified scenario has many variants. First, some invasions such as those by Africanized bees in the Americas and zebra mussels in the Great Lakes may go through only a brief lag phase, or none at all (Crooks and Soule 1996). On the other hand, many immigrant species do not become abundant and widespread for decades, during which time they may remain inconspicuous. Perhaps the most spectacular example involves the fungus, *Entomophaga maimaiga,* introduced to the United States for control of the gypsy moth (*Lymantria dispar*). After effectively disappearing for 79 years, it made a reappearance in 1989 and is now inflicting substantial mortality on the moth in the northeastern United States (Hajek et al. 1995). Brazilian pepper (*Schinus terebinthifolius*) was introduced to Florida in the 19th century but did not become widely noticeable until the early 1960s. It is now established on >280 000 ha in south Florida, often in dense stands that exclude all other vegetation (Schmitz et al. 1997).

During the lag phase, it can be difficult to distinguish doomed populations from future invaders (Cousens and Mortimer 1995). Most extinctions of immigrant populations occur during the lag phase, yet the dynamics of such a population are often statistically indistinguishable from those of a future invader, which is growing slowly but inexorably larger. This similarity in the size and range of these populations frustrates attempts to predict future invaders while they are few in numbers and presumably controllable.

Whether most invasions endure lag phases, and why they occur, remain conjectural (Williamson 1996). Any lag phase in the population growth and range expansion for a potential invasion most likely results from several forces and factors operating singly or in combination:

1) *Limits on the detection of a population's growth.* A lag could be perceived simply through the inability to detect still small and isolated but nonetheless growing populations in a new range (Crooks and Soule 1996).

2) *The number and arrangement of infestations of immigrants.* Usually an invasion will proceed fastest from among many small, widely separated infestations or foci compared with a single larger one (Moody and Mack 1988). Unless many foci arise soon after immigration, an unlikely event, the lag phase could be

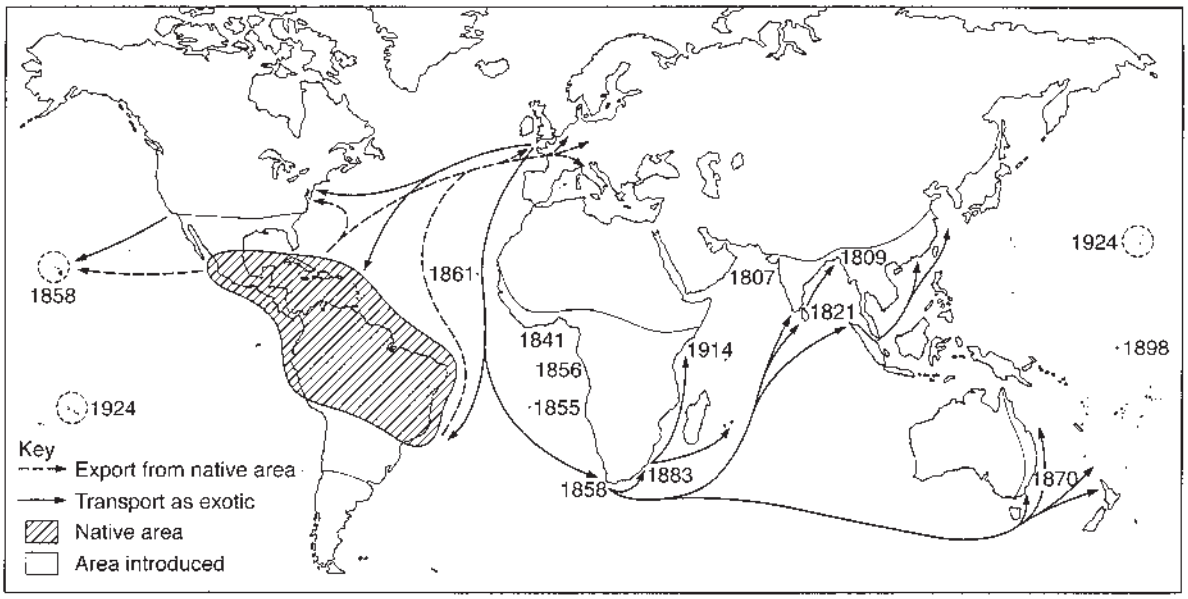

FIG. 1. Some invaders have widely separated new ranges, the products of repeated human dispersal and cultivation. For example, the shrub *Lantana camara* was carried transoceanically throughout the 19th and early 20th century to many subtropical and tropical locales where it has proliferated. Years refer to dates of introduction in widely separated locales (Cronk and Fuller 1995).

the result of an initial limitation in widely separated foci.

3) *Natural selection among rare or newly created genotypes adapted to the new range.* Strong selection in a new range may simply destroy all but the few preadapted genotypes, thus accounting in part for the very high extinction rate among immigrant populations. Alternatively, the lag phase could reflect the time for emergence of new genotypes through outcrossing among immigrants, although proof of this explanation has proven elusive (Baker 1974, Crooks and Soule 1996).

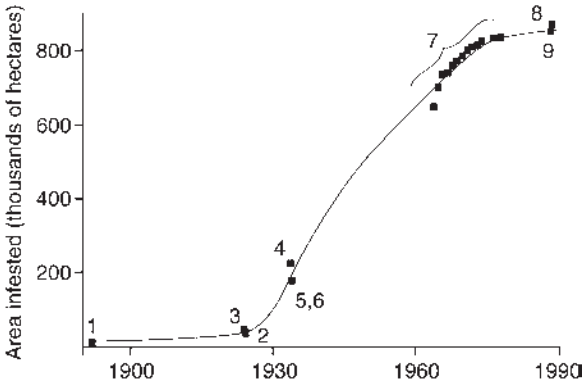

FIG. 2. Many invaders occupy new ranges at an accelerating rate with pronounced ''lag'' and ''log'' phases of proliferation and spread. Terrestrial plant invasions most commonly illustrate this pattern (e.g., the spread of *Opuntia aurantiaca* in South Africa [Moran and Zimmerman 1991]).

4) *The vagaries of environmental forces.* The order, timing, and intensity of environmental hazards are critical for all populations, but the consequences of consecutive periods of high mortality are most severe among small populations. Thus, a small immigrant population could persist or perish largely as a consequence of a lottery-like array of forces across time and generations: i.e., whether the first years in the new range are benign or severe; whether environmental forces combine to destroy breeding-age individuals as well as their offspring. Immigrant populations may also be so small that demographic stochasticity, simply the odds that few, if any, reproductive individuals will produce offspring as influenced by endogenous forces, can also be important (Simberloff 1988). Much of the downward spiral seen in the size of immigrant populations could be attributed simply to the single and collective action of these two forces (Mack 1995).

Clearly, some populations overcome these long odds and grow to a threshold size such that extinction from chance events, demographic or environmental, becomes unlikely (Crawley 1989). One great irony about biotic invasions is that humans, through cultivation and husbandry, often enhance the likelihood that nonindigenous populations will reach this threshold and become established. This husbandry includes activities that protect small, vulnerable populations from environmental hazards such as drought, flooding, frost, parasites, grazers, and competitors. With prolonged human effort, such crops, flocks, or herds can grow to a size that is not in imminent danger of extinction. In fact,

the population may no longer require cultivation to persist (Lousley 1953). At this point, the population has become naturalized and may eventually become invasive. Thus, humans act to increase the scope and frequency of invasions by serving as both effective dispersal agents and also protectors for immigrant populations, helping favored nonindigenous species beat the odds that defeat most immigrants in a new range (Veltman et al. 1996).

At some point, whether after years or decades, populations of a future invader may proceed into a phase of rapid and accelerating growth, in both numbers and areal spread (Fig. 2). This eruption often occurs rapidly, and there are many first-hand accounts of invasions that proceeded through this phase despite the concerted efforts of the public to control them (Thompson 1922, Elton 1958, Mack 1981). Eventually, an invasion reaches its environmental and geographic limits in the new range, and its populations persist but do not expand.

Identifying Future Invaders and Vulnerable Communities

Identifying future invaders and predicting their likely sites of invasion are of immense scientific and practical interest. Learning to identify invaders in advance would tell us a great deal about how life history traits evolve (Crawley et al. 1996) and how biotic communities are assembled (Lawton 1987). In practical terms, it could reveal the most effective means to prevent future invasions (Reichard and Hamilton 1997). Current hypotheses or generalizations about traits that distinguish both successful invaders and vulnerable communities all concern some extraordinary attributes or circumstances of the species or communities. And all are based on retrospective explanations for past invasions. Evaluation of these generalizations has been difficult because they rely on post hoc observation, correlation, and classification rather than experimentation (Ehrlich 1986, Cronk and Fuller 1995, Holm et al. 1997). Probably no invasions (except some invasions of human parasites) have been tracked closely and quantified from their inception. Furthermore, predictions of future invaders and vulnerable communities are inextricably linked (Crawley 1987). Did a community sustain an invasion because it is intrinsically vulnerable or because the invader possesses extraordinary attributes? Do communities with few current invaders possess intrinsic resistance or have they been reached so far by only weak immigrants? This second issue is confounded by the enormous bias of the opportunity for immigration among different locales (Simberloff 1986, Lonsdale 1999).

Attributes of invaders

Biologists have long sought to explain why so few naturalized species become invaders (Henslow 1879, as cited in Gray 1879). Intriguingly, some species have invaded several widely separated points on the planet (e.g., *Eichhornia crassipes, Imperata cylindrica, Parthenium hysterophorus, Avena fatua, Sturnus vulgaris, Rattus rattus, Lantana camara,* Long 1981, Brown 1989, Holm et al. 1997), which is the ecological equivalent of winning repeatedly in a high-stakes lottery. Such repeat offenders, or winners, have sparked the obvious question: do they and other successful invasive species share attributes that significantly raise their odds for proliferation in a new range (Ehrlich 1986, Rejmanek and Richardson 1996)?

Many attempts have been made to construct lists of common traits shared by successful invaders (e.g., Wodzicki 1965, Roy 1990). The hope behind such efforts is clear: detect a broad list of traits that, for example, invading insects, aquatic vascular plants, or birds share as a group, then perhaps the identity of future invaders could be predicted from these taxonomic groups. Some invaders do appear to have traits in common, but so far such lists are generally applicable for only a small group of species, and exceptions abound (cf. Crawley 1987, Rejmanek and Richardson 1996).

Relatives of invaders, particularly congeners, seem to be obvious candidates for possession of shared invasive attributes. Taxonomic affinities can indeed identify some potential problems: all but one of the Melastomes naturalized in Hawaii, for instance, are invasive (Wagner et al. 1990). Many of the world's worst invasive plants belong to relatively few families and genera: Asteraceae, Poaceae, *Acacia, Mimosa, Cyperus* (Heywood 1989, Binggeli 1996, Holm et al. 1997). Rejmanek and Richardson (1996) contend they can successfully predict retrospectively which pines introduced to South Africa are most invasive, based on a list of morphological and ecological characteristics. Furthermore, both Starlings (*Sturnus*) and Crows (*Corvus*) have several invasive, or at least widely naturalized, species (Long 1981). But most biotic invaders have few, if any, similarly aggressive relatives (e.g., *Eichhornia crassipes* is the only *Eichhornia* that is invasive [Barrett 1989]). This lack of correspondence could simply reflect a lack of opportunities for immigration rather than a lack of attributes for invasion (Simberloff 1989). But the circumstantial evidence suggests otherwise: guilt by (taxonomic) association has proven imprecise at predicting invasive potential. Many combinations of traits can apparently spell persistence in a new range, but our ability so far to decipher and quantify these combinations remains poor.

Community vulnerability to invasion

As stated above, attempts to predict relative community vulnerability to invasions have also prompted generalizations, including the following.

Vacant, under- or unutilized niches.—Some com-

TABLE 1. Escape from native parasites and predators often translates into a huge benefit in plant performance, including fitness.

Variable	*Chrysanthemoides monilifera*		*Acacia longifolia*	
	Australia	South Africa	Australia	South Africa
Main flowering time	Apr–Aug	Jun–Sep	Aug–Oct	Jul–Sep
Flowers/m^2	1010 ± 170†	840 ± 136	530 ± 30	···
Fruit/flower	6.6 ± 0.3	4.5 ± 0.1	1.1 ± 0.1	···
Green fruit/m^2	6660‡	3755	580	···
Ripe seeds/m^2	4450 ± 750	2160 ± 350	364 ± 70	2923 ± 555
Soil seeds/m^2				
Fragmented	6380 ± 605	2352 ± 20	25 ± 4.2	···
Whole	2475 ± 560	2320 ± 17	7.5 ± 1.0	7600 ± 1440
Viable	2030 ± 460	46 ± 28	5.6 ± 0.8	7370 ± 1400

Notes: Chrysanthemoides monilifera and *Acacia longifolia* are native to South Africa and Australia, respectively. Plants of both species display much greater flower and seed production when grown in the other country, benefiting from the escape from native pests and little or no attack by native pests in their new ranges (Weiss and Milton 1984).

† Values are means ± SE.

‡ Calculated.

munities such as tropical oceanic islands appear to be particularly vulnerable to invasions (Elton 1958), although the evidence can be equivocal (Simberloff 1995). The vacant niche hypothesis suggests that island communities and some others are relatively impoverished in numbers of native species and thus cannot provide ''biological resistance'' to nonindigenous species (sensu Simberloff 1986). However, many potential invaders arriving on islands would find no pollinators, symbionts, or other required associates among the native organisms, a factor that might provide island communities with a different form of resistance to invasion. Yet actual demonstration of vacant niches anywhere has proved difficult (Simberloff 1995).

Escape from biotic constraints.—Many immigrants arrive in new locales as seeds, spores, eggs, or some other resting stage without their native associates, including their usual competitors, predators, grazers, and parasites (Elton 1958, Strong et al. 1984). This ''great escape'' can translate into a powerful advantage for immigrants. All aspects of performance such as growth, longevity, and fitness can be much greater for species in new ranges (Weiss and Milton 1984, Crawley 1987; Table 1). According to this hypothesis, an invader persists and proliferates not because it possesses a suite of extraordinary traits but rather because it has fortuitously arrived in a new range without virulent or at least debilitating associates. For example, the Australian brushtail possum (*Trichosurus vulpecula*) has become an invader in New Zealand since its introduction 150 years ago (Clout 1999). In New Zealand it has fewer competitors for food and shelter, no native microparasites, and only 14 species of macroparasites, compared with 76 in Australia (Clark et al. 1997). Its population densities in New Zealand forests are 10-fold greater than those prevailing in Australia. Of course, such a successful performance depends on an immigrant not acquiring a new array of competitors, predators, and parasites in its adopted community. It is probably inevitable on continents that an invader will acquire these foes, especially as it expands its range and comes into contact with a wider group of native species (Strong et al. 1984). The idea of escape from biotic constraints is the most straightforward hypothesis to explain the success of an invader, and also provides the motivation for researchers to search for biological control agents among its enemies in its native range (De Bach and Rosen 1991).

Community species richness.—Elton (1958) proposed that community resistance to invasions increases in proportion to the number of species in the community, its species richness. To Elton, this followed from his hypothesis that communities are more ''stable'' if they are species-rich. This idea is a variant of the vacant niche hypothesis; i.e., a community with many species is unlikely to have any vacant niches that cannot be defended successfully from an immigrant. On land, however, resistance to plant invasion may correlate more strongly with the architecture of the plant community (specifically, the maintenance of a multitiered plant canopy) than with the actual number of species within the community. For instance, many forest communities have remained resistant to plant invaders as long as the canopy remained intact (Corlett 1992). Here again, exceptions abound (Simberloff 1995).

Disturbance before or upon immigration.—Humans, or the plants and animals they disperse and domesticate, may encourage invasions by causing sudden, radical disturbances in the environment (Harper 1965, Mack 1989). If native species can neither acclimatize nor adapt, the subsequent arrival of preadapted immigrants can lead swiftly to invasions. Such biological consequences can be provoked by fire, floods, agricultural practices, or livestock grazing on land, or by drainage of wetlands or alterations of salinity, and nu-

TABLE 2. Loss of the American chestnut (*Castanea dentata*) through its destruction by the invasive fungus *Endothia parasitica* was swift.

Species	Basal area (dm^2/ha)			Density (no. stems/ha)		
	1934	1941	1953	1934	1941	1953
Castanea dentata	200.53	144.67	3.38	187.82	146.98	16.67
Carya spp.	70.68	60.56	77.82	55.93	62.24	73.81
Quercus prinus	39.43	38.12	53.35	30.71	29.86	25.00
Quercus ruba	36.95	36.39	19.47	29.87	25.45	9.99
Quercus velutina	35.97	40.04	67.44	8.58	13.92	28.81
Aesculus octandra	15.78	16.43	19.02	3.32	3.43	3.56
Quercus alba	15.75	18.50	10.34	10.72	11.41	13.43
Robinia pseudoacacia	14.66	12.86	7.74	14.89	19.62	6.67
Liriodendron tulipfera	11.05	20.83	48.80	38.57	57.39	61.55
Acer rubrum	7.51	9.29	13.99	23.07	22.70	22.86
Betula lenta	7.44	7.78	11.13	6.07	6.07	10.23
Quercus coccinea	5.63	8.16	26.09	1.90	5.71	4.41
Miscellaneous	23.38	27.45	30.15	54.92	62.12	60.86
Total	484.83	441.08	388.72	466.37	466.90	337.85

Notes: Basal area (dm^2/ha) and density (no. stems/ha) on Watershed 41 (Coweeta Hydrologic Laboratory, North Carolina in 1934, 1941, and 1953 record original dominance of chestnut in this stand and its destruction within 20 years after arrival of the parasite. Data are for all stems $\geq$ 1.27 cm (data converted to metric units from Nelson [1955]).

trient levels in streams and lakes. Novel disturbances, or intensification of natural disturbances such as fire, have played a significant role in some of the largest biotic invasions, such as the extensive plant invasions across vast temperate grasslands in Australia and North and South America (Mack 1989, D'Antonio and Vitousek 1992).

The difficulty of predicting any community's vulnerability to an invasion is increased substantially by the bias of immigration, i.e., it is nearly impossible to test critically the relative merits of these hypotheses because of confounding issues, such as the enormous differences among communities in their opportunity to receive immigrants. The likelihood that a community will have received immigrants is influenced largely by its proximity to a seaport or other major point of entry and also the frequency, speed, and mode of dispersal of the immigrants themselves (Simberloff 1989, Williamson 1996, Lonsdale 1999). For example, for more than 300 years an ever-growing commerce has both accidentally and deliberately delivered nonindigenous species to the coasts of South Africa and the northeastern United States. Not surprisingly, the naturalized floras in these regions are very large (Seymour 1969, Richardson et al. 1992). In contrast, some continental interiors, such as Tibet, have minuscule numbers of naturalized plants and animals and few, if any, invaders (Wang 1988). The native biota in such regions may present strong barriers to naturalization and invasion, but isolation alone could explain the lack of invaders.

BIOTIC INVASIONS AS AGENTS OF GLOBAL CHANGE

Human-driven biotic invasions have already caused wholesale alteration of the earth's biota, changing the roles of native species in communities, disrupting evolutionary processes, and causing radical changes in abundances, including extinctions (Cronk and Fuller 1995, Rhymer and Simberloff 1996). These alterations are collectively a threat to global biodiversity that is second in impact only to the direct destruction of habitat (Walker and Steffen 1997).

Biotic invaders themselves often destroy habitat, for instance by altering siltation rates in estuaries and along shorelines (Bertness 1984, Gray and Benham 1990). In the past, the scope of this direct loss of habitat was local or at most regional. However, with invasions occurring at an unprecedented pace, invaders are collectively altering global ecosystem processes (Vitousek et al. 1996). Furthermore, the growing economic toll caused by invasions is not limited by geographic or political boundaries (U.S. Congress 1993, Sandlund et al. 1996). Invaders are by any criteria major agents of global change today. We provide below only a brief sketch of the range of effects that biotic invaders cause to biodiversity and ecological processes.

Population-level effects

Invasions by disease-causing organisms can severely impact native species. The American chestnut (*Castanea dentata*) once dominated many forests in the eastern United States, especially in the Appalachian foothills (Braun 1950), until the Asian chestnut blight fungus arrived in New York City on nursery stock early in this century. Within a few decades, the blight had spread throughout the eastern third of the United States, destroying almost all American chestnuts within its native range (Roane et al. 1986) (Table 2). The mosquito *Culex quinquefasciatus* that carries the avian malaria parasite was inadvertently introduced to the Hawaiian Islands in 1826. The parasite itself arrived subsequently, along with the plethora of Eurasian birds that now dominate the Hawaiian lowlands. With avian malaria

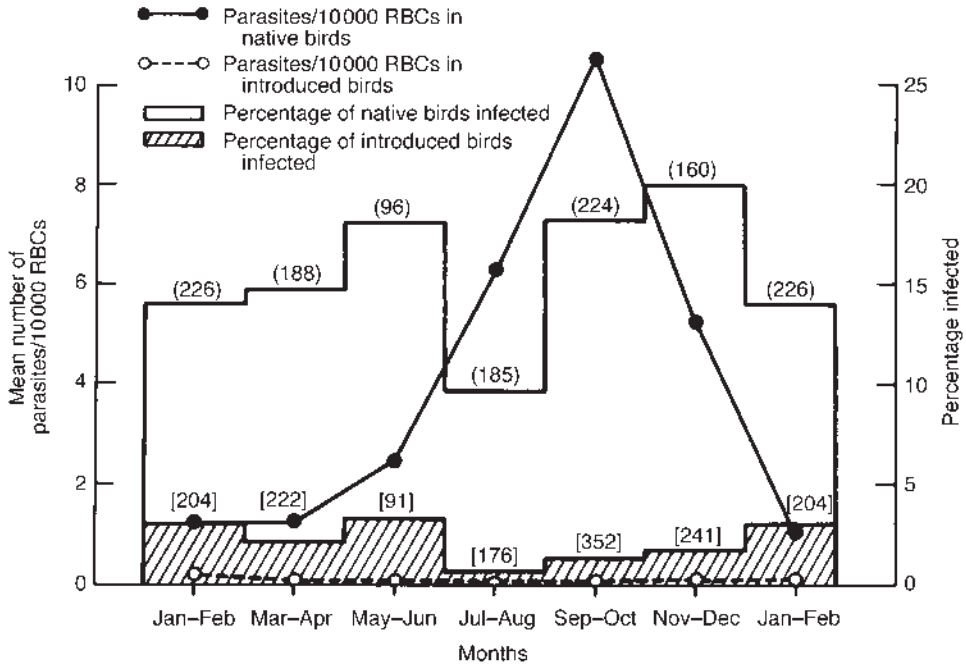

FIG. 3. Percentage levels of native and nonindigenous birds on Mauna Loa, Hawaii, infected with avian malaria, 1978–1979 and mean numbers of parasites per 10 000 RBCs. As a result of the native birds' greater susceptibility, they were largely restricted to higher elevations. Numbers in brackets or parentheses are sample sizes (Van Riper et al. 1986). RBC = red blood cells.

rampant in the lowlands, the Eurasian invaders, which are at least somewhat resistant to it, have excluded native Hawaiian birds, which are highly susceptible to the disease (van Riper et al. 1986; Fig. 3).

Predation and grazing by invaders can also devastate native species. The predatory Nile perch (*Lates nilotica*), which was introduced into Africa's Lake Victoria, has already eliminated or gravely threatens more than 200 of the 300 to 500 species of the great evolutionary radiation of native cichlid fishes (Goldschmidt 1996). Feral and domestic cats have been transported to every part of the world and have become devastating predators of small mammals and ground-nesting or flightless birds. On many oceanic islands, feral cats have depleted breeding populations of seabirds and endemic land birds. In New Zealand, cats have been implicated in the extinction of at least six species of endemic birds, as well as some 70 populations of island birds (King 1985). In Australia, cat predation takes its biggest toll on small native mammals. Cats are strongly implicated in 19th century extinctions of at least six species of native Australian marsupials (*Pseudomys* and *Notomys*) (Dickman 1996). The brown tree snake (*Boiga irregularis*), introduced to Guam in the late 1940s from the Admiralty Islands (Rodda et al. 1992), has already virtually eliminated all forest birds in Guam (Savidge 1987). Goats introduced to St. Helena Island in 1513 almost certainly extinguished more than 50 endemic plant species, although only seven were scientifically described before their extinction (Groombridge 1992). Invaders still extract a severe toll on St. Helena. A South American scale insect (*Orthezia insignis*) has recently threatened the survival of endemic plants, including the now rare native tree, *Commidendrum robustum.* Two years after the scale infestation began in 1993, at least 25% of the 2000 remaining trees had been killed (Booth et al. 1995).

Nonindigenous species may also compete with natives for resources. The North American gray squirrel (*Sciurus carolinensis*) is replacing the native red squirrel (*S. vulgaris*) in Britain by foraging more efficiently (Williamson 1996). The serial invasion of New Zealand's *Nothofagus* forests by two wasp species has harmed native fauna, including both invertebrates that are preyed on by wasps and native birds that experience competition for resources (Clout 1999). For instance, the threatened Kaka (*Nestor meridionalis*), a forest parrot, forages on honeydew produced by a native scale insect. But >95% of this resource is now claimed by invasive wasps during the autumn peak of wasp density, and as a result the parrots abandon the *Nothofagus* forests during this season (Beggs and Wilson 1991). The native biota of the Galapagos Islands is threatened by goats and donkeys, not only because of their grazing but because they trample the breeding sites of tortoises and land iguanas (Bensted-Smith 1998). Invasive plants have diverse means of competing with natives. Usurping light and water are probably the most com-

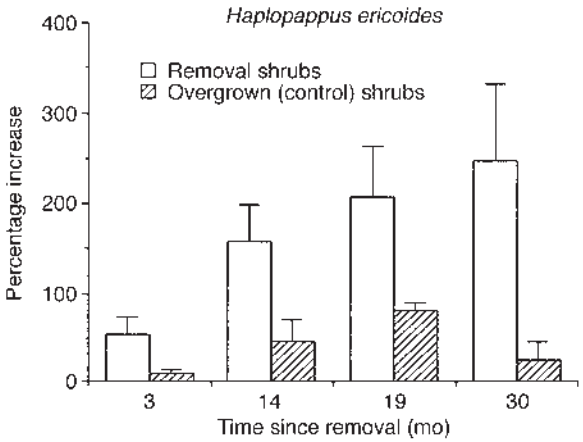

FIG. 4. *Carpobrotus edulis*, a sprawling perennial plant, invades California coastal communities. It overtops native species, such as *Haplopappus ericoides*, and competes aggressively for soil water. Its removal coincides with a marked increase in canopy area of *H. ericoides*; values represent change as a percentage of initial canopy area. Error bars are +1 SE (D'Antonio and Mahall 1991).

mon tactics. For example, the succulent mat-former, *Carpobrotus edulis*, pervades the same shallow rooting zone as native shrubs in California coastal communities. Its removal coincides with improved water availability for the natives, strongly suggesting that the invasive *C. edulis* usurps water that would otherwise be available for native plants' growth (D'Antonio and Mahall 1991; Fig. 4).

Interference competition by invasive species is even more easily demonstrated. For example, several widely introduced ant species (the red fire ant [*Solenopsis invicta*], the Argentine ant [*Linepithema humile*], and the big-headed ant [*Pheidole megacephala*]) all devastate large fractions of native ant communities by aggression (references in Williams 1994; Fig. 5). Although the evidence is often equivocal for allelopathy, the widely introduced agricultural pest *Agropyron repens* is one of the few species that likely interferes with competitors through release of phytotoxins (Welbank 1960).

Invasive species can also eliminate natives by mating with them, a particular danger when the native species is rare. For example, hybridization with the introduced North American Mallard (*Anas platyrhynchos*) threatens the existence, at least as distinct species, of both the New Zealand Gray Duck (*Anas superciliosa*) and the Hawaiian Duck (*A. wyvilliana*; references in Rhymer and Simberloff 1996). Hybridization between a nonindigenous species and a native one can even produce a new invasive species. For example, North American cordgrass (*Spartina alterniflora*), carried in shipping ballast to southern England, hybridized occasionally with British native cordgrass (*S. maritima*). These hybrid individuals were sterile, but eventually one underwent a doubling of chromosome number to produce a fertile, highly invasive species, *S. anglica* (Thompson 1991). Hybridization can threaten a native species even when the hybrids do not succeed, simply because crossbreeding reduces the number of new offspring added to the species' own population. For example, females of the European mink (*Mustela lutreola*), already gravely threatened by habitat deterioration, hybridize with males of introduced North American mink (*M. vison*). Embryos are invariably aborted, but the wastage of eggs exacerbates the decline of the native species (Rozhnov 1993).

Species can evolve after introduction to a new range. The tropical alga, *Caulerpa taxifolia*, evolved tolerance for colder temperatures while it was growing at the aquarium of the Stuttgart Zoo and other public and private aquaria in Europe. Since then it has escaped into the northwest Mediterranean, and its new tolerance of winter temperatures has permitted it to blanket vast stretches of the seafloor, threatening nearshore marine communities (Meinesz 1999). Evolution can also

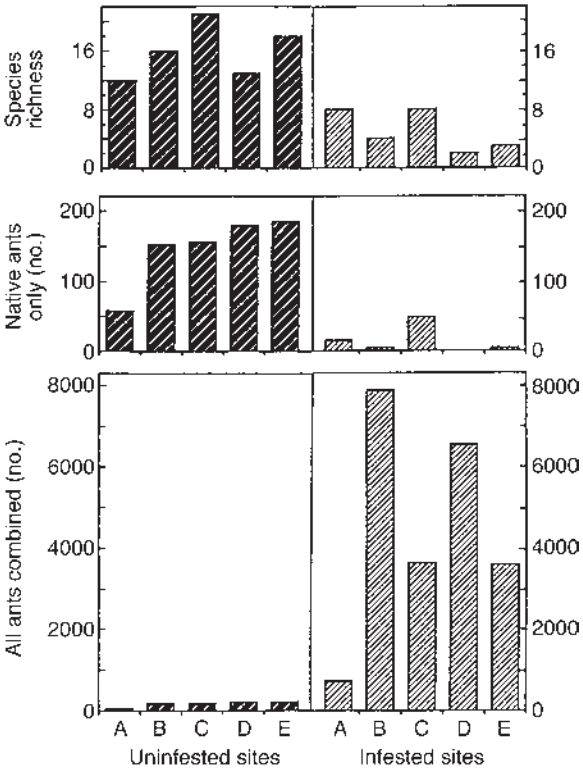

FIG. 5. Invasion of Brazilian fire ants, *Solenopsis invicta*, into woodlands and grasslands in central Texas causes a radical change in the density and species composition of the native ant fauna, as reflected in pitfall trap records. Species richness and numbers of native ant workers decline sharply, while the invader's populations are several orders of magnitude greater than all ants in uninfested sites. Note the much larger scale on the bottom graph, showing numbers of all ants combined. All values were calculated with site pitfall trap totals summed across May, July, and October 1987 (Porter and Savignano 1990).

change potential impacts in subtler ways. *Bathyplectes curculionis,* an ichneumonid parasitic wasp imported to the United States to control the alfalfa weevil (*Hypera postica*) was originally ineffective against the Egyptian alfalfa weevil, *Hypera brunneipennis.* Dissections showed that 35–40% of its eggs were destroyed by the immune response of the larval weevil. Samples taken fifteen years later showed only 5% egg loss (Messenger and van den Bosch 1971).

Community- and ecosystem-level effects

The biggest ecological threat posed by invasive species is the disruption of entire ecosystems, often by invasive plants that replace natives. For example, the Australian paperbark tree (*Melaleuca quinquenervia*), which at one time increased its range in south Florida by >20 ha per day, replaces cypress, sawgrass, and other native species. It now covers about 160 000 ha, often in dense stands that exclude virtually all other vegetation. It provides poor habitat for many native animals, uses huge amounts of water, and intensifies the fire regime (Schmitz et al. 1997). Similarly, *Mimosa pigra* has transformed 80 000 ha of tropical wetland habitat in northern Australia into monotonous tall shrubland (Braithwaite et al. 1989), excluding native waterbirds. The South American shrub, *Chromolaena odorata* or Siam weed, is not only an aggressive invader in both Asia and Africa, suppressing the regeneration of primary forest trees, but also provides feeding niches that can sustain other pests (Boppré et al. 1992). Another highly invasive neotropical shrub, *Lantana camara,* serves as habitat for the normally stream-dwelling tsetse fly in East Africa, increasing the incidence of sleeping sickness in both wild and domesticated animals, as well as in humans (Greathead 1968).

Many invasive species wreak havoc on ecosystems by fostering more frequent or intense fires, to which key native species are not adapted. *Melaleuca quinquenervia* has this effect in Florida (Schmitz et al. 1997), as do numerous invasive grasses worldwide (D'Antonio and Vitousek 1992). In general, grasses produce a great deal of flammable standing dead material, they can dry out rapidly, and many resprout quickly after fires (D'Antonio and Vitousek 1992).

An invasion of Hawaii Volcanoes National Park by a small tree, *Myrica faya,* native to the Canary Islands, is transforming an entire ecosystem because the invader is able to fix nitrogen and increase supplies of this nutrient in the nitrogen-poor volcanic soils at a rate 90-fold greater than native plants (Vitousek and Walker 1989; Table 3). Many other nonindigenous plants in Hawaii are able to enter only sites with relatively fertile soils, so *M. faya* paves the way for further invasions, raising the threat of wholesale changes in these plant communities (Vitousek et al. 1987). *Myrica faya* also attracts the introduced Japanese White-eye (*Zosterops japonica*); the White-eye disperses *Myrica* seeds (Vitousek and Walker 1989) and is believed to be a competitor of several native bird species (Mountainspring and Scott 1985).

TABLE 3. *Myrica faya,* an invasive nitrogen-fixing tree in Hawaii, radically increases the local nitrogen budget and thus facilitates the entry of other nonindigenous species into native communities.

Source	N input (kg/ha)	
	LB	UB
Fixation by *Myrica faya*	18.5	0.2
Native N fixation		
Lichens	0.02	0.06
Litter	0.12	0.16
Decaying wood	0.05	0.03
Precipitation		
NH_4-N + $N0_3$-N	1.0	1.0
Organic N	2.8	2.8
Total inputs	22.5	4.2

Note: Annual nitrogen inputs are compared for two sites: LB, in which *M. faya* density was >1000 plants/ha by 1987; and UB, in which *M. faya* had only recently arrived (Vitousek and Walker 1989).

Ecosystem transformations wrought by invaders have been so complete in some locales that even the landscape itself has been profoundly altered. ''The Bluegrass Country'' of Kentucky invokes images for most Americans of a pastoral, even pristine, setting. But bluegrass is *Poa pratensis,* a Eurasian invader that supplanted the region's original vegetation, an extensive open forest and savanna with *Elymus* spp. and possibly *Arundinaria gigantea* in the understory (Daubenmire 1978), after European settlement and land clearing. The European periwinkle (*Littorina littorea*), introduced to Nova Scotia around 1840, has transformed many of the coastal inlets along the northeast coast of North America from mudflats and salt marshes to a rocky shore (Bertness 1984; Fig. 6). Similar wholesale transformations of the landscape have occurred elsewhere, including the conversion of the Florida Everglades from a seasonally flooded marsh to a fire-prone forest of invasive trees (Bodle et al. 1994) and the invasion of the fynbos in South Africa's Cape Province by eucalypts, pines, *Acacia,* and *Hakea* spp. (van Wilgen et al. 1996). Heavy water use by these invasive trees in South Africa has led to major water losses (estimated at 3×10^9 m^3/y, Anonymous 1997*b*), and many rivers now do not flow at all or flow only infrequently. This change has in turn reduced agricultural production and also threatened the extinction of many endemic plant species from the Cape flora (van Wilgen et al. 1996).

Our best estimate is that, left unchecked, the current pace and extent of invasions will influence other agents of global change, principally the alteration of greenhouse gases in the atmosphere, in an unpredictable but profound manner (Mack 1996). The current transfor-

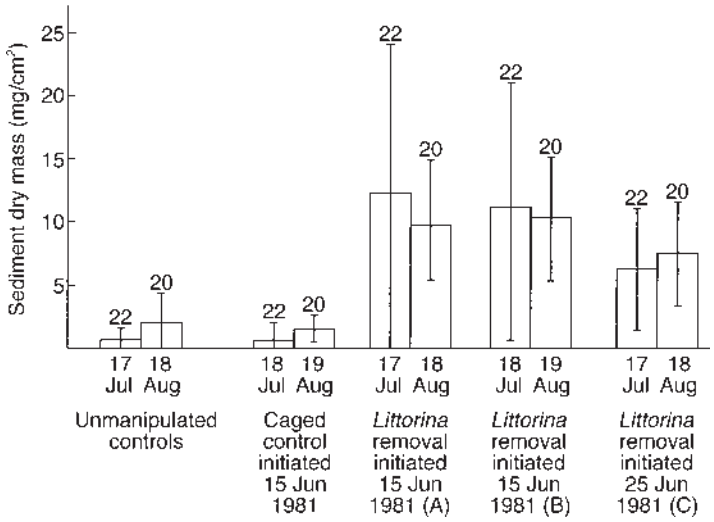

FIG. 6. *Littorina littorea* (European periwinkle) has greatly increased the extent of rocky shoreline along New England and the Canadian Maritime coast through its grazing on marine plants that once induced siltation and mud accumulation. Its removal and exclusion from areas caused a rapid resumption in sedimentation with accompanying algal colonization. Error bars show ± 1 SD; sample sizes of sites appear over each bar (Bertness 1984).

mation of ecosystems in the Amazon basin through the burning of forests and their replacement with African grasses provides one of the most ominous examples. For example, in Brazil the conversion of diverse forest communities into croplands and pastures has often involved the deliberate sowing of palatable African grasses (*Melinis minutiflora, Hyparrhenia rufa, Panicum* spp., and *Rhynchelytrum repens*) (Eiten and Goodland 1979). The spread and proliferation of these grasses has been fostered by fire. By 1991 cleared forest sites that largely support grass-dominated communities were estimated to cover 426 000 km^2 in Brazil alone (Fearnside 1993); much more of the 4×10^6 km^2 of the multilayered forest in the Amazon basin in Brazil is at risk of similar conversion.

These extensive human-driven grass invasions could not only alter ecosystem-level properties in Brazil but also have repercussions worldwide (Vitousek et al. 1996). Perhaps most significant is the fact that grasslands contain much less plant biomass than the native forests and thus sequester less carbon (Kaufmann et al. 1995, Kaufmann et al. 1998). Given the extent of the neotropical forests, continuing conversions to grasslands could exacerbate the buildup of carbon dioxide in the atmosphere, potentially influencing global climate. Less evapotranspiration from grasslands compared to tropical forest (Shukla et al. 1990) could also translate into greater convective heat loss and increases in air temperature (Walters 1979). Although fire and other agents of land-clearing initiate these changes in the Amazon watershed, the persistence of invasive grasses thereafter limits any natural recolonization of cleared areas by native forest species. Thus, invasive African grasses are having a ratchet-like effect in the Amazon watershed: as more of the native vegetation is converted to pasture, these grasses prevent recolonization and succession by native species (Fig. 7).

Economic consequences

Attempts to arouse public and governmental support for the prevention or control of invasions often fail because of a lack of understanding of the inextricable link between nature and economy. But the threats biotic invasions pose to biodiversity and to ecosystem-level processes translate directly into economic consequences such as losses in crops, fisheries, forestry, and grazing capacity. Yet no other aspect of the study of biotic invasions is as poorly explored and quantified. Al-

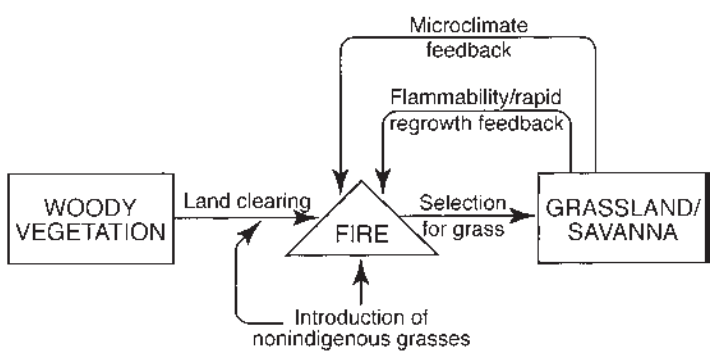

FIG. 7. Invasion of African grasses in the Amazon Basin could eventually cause the permanent conversion of this vast forested carbon sink into grassland or savanna-like areas. As depicted schematically, fire-initiated land clearing allows the entry of these grasses. The flammability of their abundant litter rapidly fosters their persistence at the expense of native woody species. This ratchet-like conversion across such a huge area holds important implications for ecosystem alteration at a global scale (D'Antonio and Vitousek 1992).

though there are ample anecdotal examples of local and even regional costs of invaders, we consistently lack clear, comprehensive information on these costs at national and especially global levels.

Biotic invasions cause two main categories of economic impact. First is the loss in potential economic output: i.e., losses in crop production and reductions in domesticated animal and fisheries survival, fitness, and production. Second is the direct cost of combating invasions, including all forms of quarantine, control, and eradication (U.S. Congress 1993). A third category, beyond the scope of this report, would emphasize the costs of combating invasive species that are threats to human health, either as direct agents of disease or as vectors or carriers of disease-causing parasites.

These costs form a hidden but onerous ''tax'' on many goods and services. Tallying these costs, however, remains a formidable task. Pimentel et al. (2000) attempted recently to tabulate the annual cost of all nonindigenous species in the United States. They estimate that nonindigenous weeds in crops alone cost U.S. agriculture ~$27 billion per year, based on a potential crop value of ~$267 billion. Loss of forage and the cost of herbicides applied to weeds in rangelands, pastures, and lawns cause a further $6 billion in losses each year. When they combined these direct losses with indirect costs for activities such as quarantine, the total cost of all nonindigenous species (plants, animals, microorganisms) exceeded $138 billion per year. By any standard, such costs are a formidable loss, even for a productive industrialized society such as the United States.

These estimates illustrate the preliminary level of our current understanding of the economics of invasions. One solution would be a more frequent application of economic tools such as cost–benefit analyses when considering proposals to import species for perceived economic benefit (Naylor 1996, Pannell 1999). When it comes to future movements of species, society needs to be able to consider results from the types of analysis economists already provide for other projects with potential environmental consequences, such as construction of hydroelectric dams, canals, and airports. We predict that cost–benefit analysis of many deliberately introduced invaders would demonstrate forcefully that their costs to society swamp any realized or perceived benefits.

Prevention and Control of Biotic Invasions

The consequences of biotic invasions are often so profound that they must be curbed and new invasions prevented. This section is divided into two parts: first, efforts to prevent the opportunity for invasions by prohibiting the entry of nonindigenous species into a new range; and second, concepts for curbing the spread and impact of nonindigenous species, including invaders, once they have established in a new range.

Preventing entry of nonindigenous species

The use of quarantine, which is intended to prohibit organisms from entering a new range, has a long history in combating human parasites (McNeill 1976). Rarely is the saying ''an ounce of prevention is worth a pound of cure'' so applicable as with biotic invasions. Most invasions begin with the arrival of a small number of individuals (Simberloff 1986, Mack 1995), and the costs of excluding these is usually trivial compared to the cost and effort of later control after populations have grown and established.

The ability of a nation to restrict the movement of biotic invaders across its borders is ostensibly governed by international treaties, key among them being the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) (Anonymous 1994). Under this agreement members of the World Trade Organization (WTO) can restrict movement of species that may pose a threat to human, animal, or plant life (Anonymous 1994). The International Plant Protection Convention (IPPC) of 1951 deals with quarantine against crop pests (Jenkins 1996), and the IPPC Secretariat also coordinates phytosanitary standards (Anonymous 1994). The SPS agreement requires WTO members to base any SPS measures on internationally agreed guidelines (see Anonymous 1994).

Unfortunately, neither the specific wording, current interpretation, nor implementation of these agreements provides totally effective control against biotic invaders. Nations may give variances or exceptions based on politico-economic considerations that outweigh biological concerns. Even if a nation attempts to ban importation of a species, its efforts may fall to international judgment if the WTO, in its regulatory capacity, rules that the ban is an unlawful or protectionist trade barrier rather than a legitimate attempt to exclude pests (Jenkins 1996). Thus, environmental concerns and politico-economic interests may clash.

Within these international guidelines, some countries, including Australia and the United States, have imposed quarantine controls that take an ''innocent until proven guilty'' approach, e.g., they have allowed entry of any nonindigenous species that are not known to be harmful. This approach has been attacked from two sides: some want to liberalize trade, remove nontariff trade barriers, and ease quarantine controls; opponents argue that the precautionary principle should apply and that a ''guilty until proven innocent'' approach should be used to tighten current quarantine protocols (Panetta et al. 1994).

The current U.S. approach is clearly inadequate to stem the tide of entering nonindigenous organisms, and the U. S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) is considering policy changes (Reichard and Hamilton 1997). These might involve conducting risk assessments that would

estimate the invasive potential of a species proposed for import (Ruesink et al. 1995). In 1997, the Australian Quarantine Inspection Service (AQIS) adopted such a risk assessment system for screening new plant imports based on their biological attributes and the consequent risk of invasiveness that they pose.

As described earlier, attempts to predict from biological attributes which species will become invasive have had very mixed success (Perrins et al. 1992). Debate continues between those who maintain that quarantine risk assessment may be achievable (Pheloung 1995, Rejmanek and Richardson 1996, Reichard and Hamilton 1997) and those who argue that prediction of invasiveness will always be extremely difficult (Simberloff 1989, Lonsdale 1994, Williamson 1996). Clearly, much research on prediction remains to be done. If risk assessment screening procedures are to be applied as part of a government policy, however, more must be considered than predictive accuracy. The low *base rate* at which species become naturalized as well as the base rate for becoming invaders means that the predictive power of any risk assessment must be very high to identify invaders reliably (Smith et al. 1999). As a consequence, screening systems are likely to produce high rates of false positives (C. S. Smith, *unpublished data*).

In after-the-fact assessments of previously introduced plants, the screening system now adopted by AQIS had an accuracy of ~85% (Pheloung 1995). The AQIS system rejects or recommends for further evaluation roughly 30% of the species proposed for import (Pheloung 1999). It is likely that the vast majority of these are ''false positives'' that would not have become invasive (Smith et al. 1999). But such an exclusionary policy risks conflict between environmentalists and commodity groups, such as horticulturists, who advocate the liberal introduction of species. Whether this degree of restriction on trade can be sustained remains to be seen; globally, society is unlikely ever to prohibit liberal movement of plants and animals in commerce. Thus, the challenge is to identify the few potentially harmful immigrants among an increasing throng of innocuous entrants.

Eradication

Eradication of a nonindigenous species is sometimes feasible, particularly if it is detected early and resources can applied quickly (Simberloff 1997). Usually, however, there is insufficient ongoing monitoring, particularly in natural areas, to detect an infestation soon after it occurs. Many regulatory agencies tend to ignore nonindigenous species, feeling that attempts at control are not worth the bother and expense until one becomes widespread and invasive. Unfortunately, by that time eradication is probably not an option (Simberloff 1997). This problem of getting agencies to take nonindigenous species seriously is exacerbated by the prolonged lag times between establishment of some immigrant species and their emergence as invaders.

Nevertheless, some potentially damaging nonindigenous species have been eradicated. For example, an infestation of the Asian citrus blackfly (*Aleurocanthus woglumi*) on Key West in the Florida Keys was eradicated between 1934 and 1937 (Hoelmer and Grace 1989). This eradication project had many advantages: there was no highway to the mainland at the time, and the only railroad bridge was destroyed by a hurricane in 1935. Insularity also featured prominently in an eradication campaign against the screwworm fly (*Cochliomyia hominivorax*) by the release of sterile males. Apparent success of this approach on Sanibel Island, Florida led to a similar trial on Curacao, and eradication in that trial led to widespread release of sterile males throughout the southeastern United States (Dahlsten 1986).

The giant African snail (*Achatina fulica*), a major pest of agriculture in many parts of its introduced range in Asia and the Pacific, was eradicated in sustained campaigns against established but fairly localized populations in south Florida (Simberloff 1997) and Queensland, Australia (Colman 1978). Local populations of nonindigenous freshwater fishes are often eradicated (Courtenay 1997), and New Zealand has eradicated various combinations of twelve mammal species (ranging from rodents through feral domestic animals) from many islands of up to 2000 ha (Veitch and Bell 1990). A few nonindigenous but not yet invasive plant populations have been completely eradicated; these were all from very small areas, however. For example, Asian common wild rice (*Oryza rufipogon*) was eliminated from 0.1 ha of the Everglades National Park (Simberloff 1997) and all Japanese dodder (*Cuscuta japonica*) was apparently destroyed in a 1-ha infestation in Clemson, South Carolina (Westbrooks 1993; R. Westbrooks, *personal communication*).

Some eradication efforts have been successful against widespread species. For example, bacterial citrus canker (*Xanthomonas campestris* pv. *citri*) was eradicated from a broad swath of the southeastern United States in the early 20th century (Merrill 1989), and a 50-year campaign succeeded in eliminating the South American nutria (*Myocastor coypus*) from Britain (Gosling 1989).

In all these instances, three key factors contributed to success. First, particular aspects of the biology of the target species suggested that the means employed might be effective. For example, the host specificity and poor dispersal ability of the citrus canker were crucial to a successful eradication strategy. Second, sufficient resources were devoted for a long enough time. If funding is cut as soon as the immediate threat of an economic impact lessens, eradication is impossible. Third, there was widespread support both from the relevant agencies and the public. Thus, for example,

people rigorously heeded quarantines and various sanitary measures.

Even when complete eradication fails, the effort may well have proven cost effective and prevented substantial ecological damage. For example, a long campaign to eradicate witchweed (*Striga asiatica*), an African root parasite of several crops in the Carolinas, has reduced the infestation from 162 000 to 6 000 ha (Westbrooks 1998). The methods employed—herbicides, soil fumigants to kill seeds, and regulation of seed-contaminated crops and machinery—would have been used anyway simply to control this invader. The control is successful even if eradication is not complete.

Other large eradication projects, however, have been so unsuccessful that they have engendered public skepticism about the entire endeavor and have, in some instances, worsened the problem. The long campaign to eradicate imported fire ants (*Solenopsis invicta* and *S. richteri*) from the southern United States has been labeled by E. O. Wilson as ''the Vietnam of entomology'' (Brody 1975) and was a $200 million disaster (Davidson and Stone 1989). Not only did fire ants reinvade areas cleared of ants by insecticides, but they also returned faster than many native ant species. The introduced range of fire ants expanded several-fold during the 20-year campaign, and enough was known at the time about the biology of these ants that the outcome could have been predicted (Davidson and Stone 1989).

Maintenance control

If eradication fails, the goal becomes ''maintenance control'' of a species at acceptable levels (Schardt 1997). Three main approaches, applied singly or in various combinations, are widely used: chemical, mechanical, and biological control.

Chemical control probably remains the chief tool in combating nonindigenous pests in agriculture. Chemical controls, unfortunately, have too often created health hazards for humans and nontarget species. For example, problems associated with DDT are well known. But the frequent evolution of pest resistance (National Research Council 1986), the high cost, and the necessity of repeated applications often make continued chemical control impossible. If the goal were to control an invasive species in a vast natural area, the cost of chemical methods alone would be prohibitive. Even when there is no firm evidence of a human health risk, massive use of chemicals over heavily populated areas inevitably generates enormous public opposition, as demonstrated by the heated responses to recent aerial spray campaigns using malathion against the medfly in California (Carey 1992).

Chemical control of plant parasites has a mixed record, depending on the parasite and the scale of required protection. In native forests in Australia, broadscale chemical control of the root fungus *Phytophthora cinnamomi* was at best only temporarily effective, while injection of individual trees was deemed too expensive (Weste and Marks 1987). The history of controlling coffee rust (*Hemileia vastatrix*) in Latin America is emblematic of the frustration of attempting to control invasive plant pathogens. Repeatedly, each affected coffee-growing country applied a barrage of fungicides, initially attempting to eradicate the parasite and then attempting to contain it (Hill and Waller 1982; J. M. Waller, *personal communication*).

Mechanical methods of controlling nonindigenous organisms are sometimes effective and usually do not engender public criticism. Sometimes they can even be used to generate public interest in and support for control of invasive species. In Florida's Blowing Rocks Preserve, volunteers helped remove Australian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebinthifolius*), and other invasive plants and to plant more than 60 000 individuals of 85 native species (Randall et al. 1997). Hand-picking of giant African snails was a key component of the successful eradication campaigns in Florida and Queensland (Simberloff 1997 and references therein). However, equipment expenses, the difficulty of actually finding the target organisms, and the geographic scale of some nonindigenous species infestations frequently render mechanical control impossible.

Hunting is often cited as an effective method of maintenance control of nonindigenous animals, and hunting and trapping were crucial in the successful eradication of the nutria from Britain. In the Galápagos Islands, park officials have a long-established campaign to eradicate nonindigenous mammals, and over the past 30 years goats have been eliminated from five islands (Ospina 1998). By contrast, recreational hunting alone is unlikely to serve as an effective control on an invasive mammal. In New Zealand, hunting of Australian brushtail possums was encouraged from 1951 to 1961 through a bounty system and harvesting of animals for pelts. More than 1 million animals each year were shot or trapped in the late 1950s. Nevertheless, the possum continued to spread (McDowall 1994). Recreational hunting of introduced red deer (*Cervus elaphus*) in New Zealand has also generally failed to reduce densities enough to speed regeneration of native forests. For both possums and red deer, widespread control is now conducted primarily by aerial application of poison baits, which has its own set of problems, including lack of widespread public acceptance (Clout 1999).

Problems with both chemical and mechanical controls have focused attention on biological control—the introduction of a natural enemy of an invasive species. In a sense, this is a planned invasion. It aims to establish in the new range at least part of the biotic control the target species experiences in its native range. Some

biological control projects have succeeded in containing very widespread, damaging infestations at acceptable levels with minimal costs. Examples include the well-known control of invasive prickly pear cactus (*Opuntia inermis* and *O. stricta*) in Australia by the moth *Cactoblastis cactorum* from Argentina (Osmond and Monro 1981); control of South American alligator weed (*Alternanthera phyloxeroides*) in Florida and Georgia by a flea beetle (Center et al. 1997), and control of the South American cassava mealybug (*Phenacoccus manihoti)* in Africa by a South American encyrtid wasp (Odour 1996). In each of these cases, the natural enemy has controlled the pest in perpetuity, without further human intervention. When the pest increases in numbers, the natural enemy increases correspondingly, causing the pest to decline, which entrains a decline in the natural enemy. Neither player is eliminated; neither becomes common.

Caveats on biological control

Biological control has recently been critically scrutinized on the grounds that nontarget species, some of them the focus of conservation efforts, have been attacked and even driven to extinction by nonindigenous biocontrol agents (Howarth 1991, Simberloff and Stiling 1996). For example, the widespread introduction of a New World predatory snail, *Euglandina rosea,* to control the giant African snail led to extinction of many endemic snail species in the Hawaiian and Society islands (Civeyrel and Simberloff 1996 and references therein). In these cases, the predators attacked many prey species, thus preventing a mutual population control from developing between the predator and any single prey species.

Insect biological control agents that have been subjected to rigorous host-specificity testing have nevertheless been known to attack nontarget species. For example, a Eurasian weevil, *Rhinocyllus conicus,* introduced to North America to control invasive musk thistle (*Carduus nutans*), is now attacking native nonpest thistles. These natives include a federally listed endangered species and narrowly restricted endemic species in at least two Nature Conservancy refuges, three national parks, and state lands (Federal Register 1997, Louda et al. 1997). Controversy about the extent of such problems focuses primarily on two issues: whether there is sufficient monitoring to detect such nontarget impacts, and the likelihood that an introduced biological control agent will evolve to attack new hosts. However, the ability of *R. conicus* to attack these native species had been detected before its release; poor legislation, rather than an incomplete assessment precipitated the controversy (J. Waage, *personal communication*). The fact that biological control agents can disperse and evolve, as can any other species introduced to a new range, implies that their preliminary testing should be extensive and conducted under extremely secure circumstances.

Exclusion and control: socioeconomic issues

The difficulties of curbing biotic invasions illustrate the problem of implementing scientifically based recommendations in an arena in which diverse segments of society all have important stakes. At every level of prevention and control, the thorny issues are as likely to be socioeconomic as scientific.

A persistent problem with current methods of exclusion and control is that they largely assume goodwill and cooperation on the part of all citizens. For widely varying reasons, large segments of entire industries are committed to the introduction, at least in controlled settings, of many nonindigenous species and are skeptical of arguments that they will escape and/or be problematic if they do escape. Thus, there is often organized opposition to proposals to stiffen regulations relating to introduction, and there is also frequent careless or even willful disregard of existing laws.

The horticulture industry is often in the vanguard of opposition to tight control of nonindigenous species. It is a diverse multibillion dollar industry with importers running the gamut from small, family operations specializing in a few species to large corporations importing hundreds of taxonomically diverse species. At one extreme, some horticulturists generate publications and websites scoffing at the very existence of ecological problems with nonindigenous species. On the other hand, many plant importers recognize the dangers and at least support quarantine measures and limited blacklists of species known to be invasive. However, as a whole, through trade associations and as individuals, horticulturists attempt to influence the political process as it concerns regulation of nonindigenous species (Sray 1997). Furthermore, individuals who purchase plants from importers are generally under far less legal obligation and undergo little scrutiny in their use of these plants.

Horticulturists have also been at least loosely allied with other interest groups that desire quite unfettered access to the world's flora. State departments of transportation, charged with landscaping highways, as well as the U.S. Natural Resource Conservation Service, constituted to battle erosion, have traditionally favored nonindigenous species for these purposes (McArthur et al. 1990). At least some state departments of transportation are now moving toward use of native plants (e.g., Caster 1994), but a long history of interaction between these departments and private horticulturists slows this process.

Agricultural interests and their regulatory agencies have had a schizophrenic relationship with nonindigenous species. On the one hand, they promote the importation of useful and profitable crop plants and livestock. On the other, they hope to control the influx of

parasites, insect pests, and agricultural weeds. For example, the thistle weevil discussed above as a biocontrol agent that attacks nontarget species was introduced to North America by Agriculture Canada and spread in the United States by the U.S. Department of Agriculture and various state agricultural agencies. The Hawaii Department of Agriculture introduced the carnivorous snail *Euglandina rosea* to the Hawaiian Islands to control the giant African snail (Davis and Butler 1964).

The pet industry is also heavily invested in nonindigenous species. As with the horticulture industry, it encompasses a tremendous range of operations in terms of size, scope, and degree and nature of specialization, and there is no monolithic stance toward threats posed by nonindigenous species and the prospect of rigorous control. As with horticulturists, through the political and publicity activities of individuals and trade organizations, the general attitude of the pet industry toward strict regulation of introductions has ranged from skepticism to outright hostility (U.S. Congress 1993, Bullington 1997).

Many domesticated or pet animals have escaped from importers and breeders (for example, when fires or storms destroyed cages), and some have become invasive. In Britain, escapees from fur farms established a feral population of nutria (Lever 1979), which became the target of a lengthy eradication campaign noted above. Sometimes, pet dealers or owners deliberately release animals. For example, some fishes are deliberately released by aquarists (Courtenay 1997). Again, as with horticulturists, once a pet is sold, the dealer has no subsequent control over the owner's actions, and the owner may be less likely than the dealer to obey formal regulations.

Controversies over the management of feral horses in both the United States and New Zealand illustrate the conflicts that readily arise between various segments of society about some widely appreciated feral domestic animals. In both countries feral horses pose documented threats to native species and ecosystems. Yet some groups contend the horses that escaped from Spanish explorers in North America ~500 years ago ''belong'' in the West, merely serving as replacements for native equids that became extinct on the continent ~10 000 years ago. In New Zealand, however, there were no native land mammals, except for bats, before introductions by people began over the past 800 years. Horses were introduced to New Zealand <200 years ago.

In New Zealand, feral horses have occupied the central North Island since the 1870s. Land development and hunting progressively reduced both their numbers and range; a 1979 census revealed only about 174 animals. By 1981, however, public lobbying resulted in creation of a 70 000-ha protected area as the herd's core range. With protection, horses expanded their range and increased to 1576 animals by 1994, essentially doubling their population every four years (New Zealand Department of Conservation 1995). In response to damage in native ecosystems caused by this rapidly growing population, the New Zealand Department of Conservation (1995) recommended removal of the protected area, eradication of horses from 70% of their range, and management to retain a herd of about 500 animals in the remaining range. The management plan, which included shooting horses, provoked intense public protest. This outcry eventually resulted in the overturning of a scientifically based management plan and a 1997 decision to round up as many horses as possible for sale. Sale of several hundred horses duly took place, but the long-term fate of the growing herd remains unresolved.

The impasse in New Zealand over feral horse control has been mirrored in Nevada, where an intense dispute has raged between land managers and pro-horse activists about the ecological impacts of feral horses, the size of feral herds, and appropriate methods of population control (Symanski 1996). At a practical level, the removal of animals by culling would probably be the simplest way of achieving population reduction, but public resistance precludes this option.

The infusion of strong public sentiment into policy for feral horses, as well as burros in the United States, would likely serve as a mild preview of public reaction to serious efforts to control feral cats. Ample evidence demonstrates that feral cats are the most serious threat to the persistence of many small vertebrates. Churcher and Lawton (1989) estimate that domestic cats kill annually at least 20 million birds in Britain; although the toll taken by feral cats is widely disputed, this mortality can only exacerbate the total effect of this nonindigenous species. The degree to which feral cats in Australia should be eradicated and domestic cats sterilized has already engendered vituperative debate. Similar discussion, pitting environmentalists against the general public, is being played out in the United States (Roberto 1995) and Europe. Few biotic invasions in coming decades will deserve more even-handed comment from ecologists than the dilemma of feral cats.

Game and fish agencies have traditionally been major importers of nonindigenous species, particularly fishes (Courtenay 1997), game birds (Bump 1968), and mammals (Cox et al. 1997). In Florida, for example, the Florida Game and Fresh Water Fish Commission maintains a laboratory to seek out and test nonindigenous fish species that might become attractive sport fish in the state's waters. The agency has imported several species, including the peacock bass (*Cichla ocellaris*), which is spreading, although its impacts on native species are uncertain (Courtenay 1997). Although at least some game and fish agencies have recently recognized the need for more regulation of nonindigenous species (Cox et al. 1997), the fact that they are still mandated

to import new species suggests a conflicted attitude. Furthermore, many private individuals and organizations release game species in new locations. Some releases of game fishes and other animals constitute deliberate flouting of laws. Groups of private individuals in the northern Rocky Mountains surreptitiously released nonindigenous fish into isolated mountain lakes, backpacking the fish to ensure that even the most isolated alpine lakes received what these individuals deemed as suitable biota (Ring 1995). Even apparently innocuous actions can have ecologically catastrophic impacts. The release of bait fishes by fishermen at the end of the day has already led to the extinction of species in the United States, including the Pecos pupfish (*Cyprinodon pecosensis*), through hybridization (Echelle and Connor 1989).

Long-term strategies for control of biotic invaders

Effective prevention and control of biotic invasions require a long-term, large-scale strategy rather than a tactical approach focused on battling individual invaders (Moody and Mack 1988, Anonymous 1997*b*, Simberloff et al. 1997). An underlying philosophy of such a strategy should be to establish why nonindigenous species are flourishing in a region and to address the underlying causes rather than simply destroying the currently most oppressive invaders. System management, rather than species management, ought to be the focus.

One of the problems of taking a tactical view of invaders, especially in a region where multiple invasive organisms are flourishing, is the prospect of simply ''trading one pest for another.'' For example, introduction of a successful biocontrol agent against only one species may be ecologically useless unless there is a strategy in place for dealing with the remaining invaders. This unintended outcome may have already occurred, possibly in the ascendance of yellow starthistle (*Hypericum performatum*) as a weed in California as the impact of biocontrol on St. John's wort increased in the 1950s (Mack, *in press*), and it may occur often. A strategic, system-wide approach is particularly appropriate for conservation areas, although it is seldom undertaken (Luken and Thieret 1997, Storrs et al. 1999).

In some nations, a broader strategic approach to the control of invaders is being put into place. Australia has recently adopted a national weed strategy aimed at reducing the impact of plant invaders (Anonymous 1997*a*). Similarly, in a project of extraordinary scale, South Africa is determined to clear all the invasive woody species from its river catchments in a 20-year program. The multispecies, multipronged strategy involves manual clearing of thickets to allow native vegetation to reestablish, treatment of cut stumps with mycoherbicides, and the use of biological control to prevent reinvasion by exotic pines. Although this program will cost US $150 million, it is far cheaper than alternatives such as massive dam-building programs to insure the nation's water supply, and it has the bonus of creating thousands of jobs (Anonymous 1997*b*).

Future Research and Policy Priorities

Extensive research on the ecology of biotic invasions dates back only a few decades (Elton 1958, Salisbury 1961). Although much has been learned, too many of the data remain anecdotal, and the field still lacks definitive synthesis, generalization, and prediction. The following include a few arenas in which research or new policy initiatives, or both, seem particularly worthwhile.

1) Clearly, we need a much better understanding of the epidemiology of invasions. As part of this goal we need much better areal assessments of on-going invasions, for both public policy decisions as well as science. Few tools are as effective as time-series maps in showing the public the course of an unfolding invasion. For example, Elton's (1958) portrayal of the geographic scale of biotic invasions gained much visual impact through his use of time-series maps. We also emphasize here the need to collect in a more deliberate manner information about the population biology of immigrations that fail (Harper 1982), since an understanding of the failure of the vast majority of immigrants can eventually help us discern the early harbingers of an impending invasion.

2) Experimentation in the epidemiology of invasions is a logical extension of 1). So far, the most comprehensive data come from observing the fates of insects released in biological control (Simberloff 1989) and birds introduced on islands (Veltman et al. 1996). We need to develop innocuous experimental releases of organisms that can be manipulated to explore the enormous range of chance events to which all immigrant populations may be subjected (e.g., Crawley et al. 1993).

3) Worthwhile economic estimates of the true cost of biotic invasions are rare and almost always involve single species in small areas. We need comprehensive cost–benefit analyses that accurately and effectively highlight the damage inflicted on the world economy by biotic invasions. The need is similar to the mandate the World Health Organization meets by analyzing and reporting the economic toll of human disease (e.g., WHO 1993).

4) Most members of society become aware of biotic invasions only through some firsthand experience, which usually involves some type of economic cost. These cases often prompt action, or at least public reaction, that is short-lived and local. We need instead a greater public and governmental awareness of the chronic and global effects of invasive organisms and the tools available to curb their spread and restrict their ecological and economic impacts. Public outreach

about biotic invaders must match or exceed current efforts that draw public attention to other ongoing threats to global change (Bright 1998, Kaiser 1999).

Conclusions

Biotic invasions are altering the world's natural communities and their ecological character at an unprecedented rate. If we fail to implement effective strategies to curb the most damaging impacts of invaders, we risk impoverishing and homogenizing the very ecosystems on which we rely to sustain our agriculture, forestry, fisheries, and other resources and to supply us with irreplaceable natural services. Given the current scale of invasions and our lack of effective policies to prevent or control them, biotic invasions have joined the ranks of atmospheric and land-use change as major agents of human-driven global change.

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Literature Cited

Anonymous. 1994. Agreement on the application of sanitary and phytosanitary measures. Annex 1. World Trade Organization, Geneva, Switzerland.

Anonymous. 1997*a*. Australian national weed strategy. Agriculture, Forestry and Fisheries Australia. Canberra, ACT, Australia.

Anonymous 1997*b*. The Working for Water Programme. 1996–97 Annual Report. Department of Water Affairs and Forestry. Pretoria, South Africa.

Baker, H. G. 1974. The evolution of weeds. Annual Review of Ecology and Systematics **5**:1–25.

Baker, H. G. 1986. Patterns of plant invasion in North America. Pages 44–57 *in* H. A. Mooney and J. A. Drake, editors. Ecology of biological invasions of North America and Hawaii. Wiley, New York, New York, USA.

Barrett, S. C. H. 1989. Waterweed invasions. Scientific American **260**:90–97.

Beggs, J. R., and P. R. Wilson. 1991. The kaka *Nestor meridionalis,* a New Zealand parrot endangered by introduced wasps and mammals. Biological Conservation **56**:23–38.

Bensted-Smith, R. 1998. The war against aliens in Galapagos. World Conservation **4**:40–41.

Bertness, M. D. 1984. Habitat and community modification by an introduced herbivorous snail. Ecology **65**:370–381.

Binggeli, P. 1996. A taxonomic, biogeographical and ecological overview of invasive woody plants. Journal of Vegetation Science **7**:121–124.

Bodle, M. J., A. P. Ferriter, and D. D. Thayer. 1994. The biology, distribution, and ecological consequences of *Melaleuca quinquenervia* in the Everglades. Pages 341–355 *in* S. Davis and J. Ogden, editors. Everglades: the ecosystem and its restoration. St. Lucie, Delray Beach, Florida, USA.

Booth, R. G., A. E. Cross, S. V. Fowler, and R. H. Shaw. 1995. The biology and taxonomy of *Hyperaspis pantherina* (Coleoptera: Coccinellidae) and the classical biological control of its prey *Orthezia insignis* (Homoptera: Ortheziidae). Bulletin of Entomological Research **85**:307–314.

Boppré, M., A. Biller, O. W. Fischer, and T. Hartmann. 1992. The non-nutritional relationship of *Zonocerus* (Orthoptera) to *Chromolaena* (Asteraceae). Pages 89–90 *in* J. H. Visser and P. Harrewijn, editors. Insect-plant relationships. Kluwer, Dordrecht, Netherlands.

Braithwaite, R. W., W. M. Lonsdale, and J. A. Estbergs. 1989. Alien vegetation and native biota in tropical Australia: the spread and impact of *Mimosa pigra*. Biological Conservation **48**:189–210.

Braun, E. L. 1950. Deciduous forests of eastern North America. Hafner, New York, New York, USA.

Bright, C. 1998. Life out of bounds. Norton, New York, New York, USA.

Brody, J. E. 1975. Agriculture department to abandon campaign against the fire ant. New York Times, April 20, p. 46.

Brown, J. H. 1989. Patterns, modes and extents of invasions by vertebrates. Pages 85–109 *in* J. A. Drake, H. A. Mooney, F. di Castri, R. H. Groves, F. J. Kruger, M. Rejmanek, and M. Williamson, editors. Biological invasions: a global perspective. Wiley, Chichester, UK.

Bullington, S. W. 1997. Regulating herps. Vivarium **8(5)**:9.

Bump, G. 1968. Foreign game investigations: a federal-state cooperative program. U.S. Department of the Interior, Washington, D.C., USA.

Carey, J. R. 1992. The medfly in California. Response to letters to the editor. Science **255**:514–516.

Carlton, J. T., and J. B. Geller. 1993. Ecological roulette: biological invasions and the global transport of nonindigenous marine organisms. Science **261**:78–82.

Caster, J. 1994. Invasive alien plants on D. O. T. right-of-way managed lands. Pages 197–205 *in* D. C. Schmitz and T. C. Brown, editors. An assessment of invasive nonindigenous species in Florida's public lands. Florida Department of Environmental Protection, Tallahassee, Florida, USA.

Center, T. D., J. H. Frank, and F. A. Dray. 1997. Biological control. Pages 245–263 *in* D. Simberloff, D. C. Schmitz, and T. C. Brown, editors. Strangers in paradise. Island, Washington, D.C., USA.

Churcher, P. B., and L. H. Lawton. 1989. Beware of well-fed felines. Natural History **98**:40–47.

Civeyrel, L., and D. Simberloff. 1996. A tale of two snails: is the cure worse than the disease? Biodiversity and Conservation **5**:1231–1252.

Clark, J. M., D. D. Heath, and M. Stankiewitz. 1997. The ectoparasites of brushtail possum *Trichosurus vulpecula* in New Zealand. New Zealand Journal of Zoology **24**:199–204.

Clout, M. N. 1999. Biodiversity conservation and the management of invasive animals in New Zealand. Pages 349–359 *in* O. T. Sandlund, P. J. Schei, and A. Viken, editors. Invasive species and biodiversity management. Kluwer, London, UK.

Colman, P. H. 1978. An invading giant. Wildlife in Australia **15(2)**:46–47.

Corlett, R. T. 1992. The ecological transformation of Singapore, 1819–1990 Journal of Biogeography **19**:411–420.

Courtenay, W. R. 1997. Nonindigenous fishes. Pages 109–122 *in* D. Simberloff, D. C. Schmitz, and T. C. Brown, editors. Strangers in paradise. Island, Washington, D.C., USA.

Cousens, R., and M. Mortimer. 1995. Dynamics of weed populations. Cambridge University Press, Cambridge, UK.

Cox, J. A., T. G. Quinn, and H. H. Boyter. 1997. Management by Florida's Game and Fresh Water Fish Commission. Pages 297–316 *in* D. Simberloff, D. C. Schmitz, and T. C. Brown, editors. Strangers in paradise. Island, Washington, D.C., USA.

Crawley, M. J. 1987. What makes a community invasible? Pages 429–453 *in* A. J. Gray, M. J. Crawley, and P. J.

Edwards, editors. Colonization, succession and stability. Blackwell Scientific, Oxford, UK.

Crawley, M. J. 1989. Chance and timing in biological invasions. Pages 407–423 *in* J. Drake, F. di Castri, R. Groves, F. Kruger, H. A. Mooney, M. Rejmanek, and M. Williamson, editors. Biological invasions: a global perspective. Wiley, New York, New York, USA.

Crawley, M. J., R. S. Hails, M. Rees, D. Kohn, and J. Buxton. 1993. Ecology of transgenic oilseed rape in natural habitats. Nature **363**:620–623.

Crawley, M. J., P. H. Harvey, and A. Purvis. 1996. Comparative ecology of the native and alien floras of the British Isles. Philosophical Transactions of the Royal Society of London, **B 351**:1251–1259.

Cronk, Q. C. B., and J. L. Fuller. 1995. Plant invaders. Chapman and Hall, London, UK.

Crooks, J., and M. E. Soule. 1996. Lag times in population explosions of invasive species: causes and implications. Pages 39–46 *in* O. T. Sandlund, P. J. Schei, and A. Viken, editors. Proceedings, Norway/UN Conference on Alien Species. Directorate for Nature Management and Norwegian Institute for Nature Research, Trondheim, Norway.

Crosby, A. W. 1972. The Columbian exchange; biological and cultural consequences of 1492. Greenwood, Westport, Connecticut, USA.

D'Antonio, C. M., and B. E. Mahall. 1991. Root profiles and competition between the invasive, exotic perennial, *Carpobortus edulis*, and two native shrub species in California coastal scrub. American Journal of Botany **78**:885–894.

D'Antonio, C. M., and P. M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle and global change. Annual Review of Ecology and Systematics **23**: 63–87.

Dahlsten, D. L. 1986. Control of invaders. Pages 275–302 *in* H. A. Mooney and J. A. Drake, editors. Ecology of biological invasions of North America and Hawaii. Springer-Verlag, New York, New York, USA.

Daubenmire, R. 1978. Plant geography. Academic Press, New York, New York, USA.

Davidson, N. A., and N. D. Stone. 1989. Imported fire ants. Pages 196–217 *in* D. A. Dahlsten and R. Garcia, editors. Eradication of exotic pests. Yale University Press, New Haven, Connecticut, USA.

Davis, C. J., and G. D. Butler. 1964. Introduced enemies of the giant African snail, *Achatina fulica* Bowdich. Proceedings of the Hawaiian Entomological Society **18**:377–389.

De Bach, P., and D. Rosen. 1991. Biological control by natural enemies. Second edition. Cambridge University Press, Cambridge, UK.

di Castri, F. 1989. History of biological invasions with emphasis on the Old World. Pages 1–30 *in* J. Drake, F. di Castri, R. Groves, F. Kruger, H. A. Mooney, M. Rejmanek, and M. Williamson, editors. Biological invasions: a global perspective. Wiley, New York, New York, USA.

Dickman, C. 1996. Overview of the impacts of feral cats on Australian native fauna. Australian Nature Conservation Agency, Canberra, ACT, Australia.

Echelle, A. A., and P. J. Connor. 1989. Rapid, geographically extensive genetic introgression after secondary contact between two pupfish species (Cyprinodon, Cyprinodontidae). Evolution **43**:717–727.

Ehrlich, P. R. 1986. Which animal will invade? Pages 70–95 *in* H. A. Mooney and J. A. Drake, editors. Ecology of biological invasions of North America and Hawaii. Springer-Verlag, New York, New York, USA.

Eiten, G., and R. Goodland. 1979. Ecology and management of semi-arid ecosystems in Brazil. Pages 277–300 *in* B. H. Walker, editor. Management of semi-arid ecosystems. Elsevier, Amsterdam, The Netherlands.

Elton, C. S. 1958. The ecology of invasions by animals and plants. Methuen, London, UK.

Fayle, C. E. 1933. A short history of the world's shipping industry. Allen and Unwin, London, UK.

Fearnside, P. M. 1993. Deforestation in Brazilian Amazonia: the effect of population and land tenure. Ambio **22**:537–545.

Federal Register. 1997. Rules and Regulations. Department of the Interior, Fish and Wildlife Service, 50 CFR part 17, RIN 1018-AD14. Endangered and threatened wildlife and plants; determination of endangered status for two tidal marsh plants—*Cirsium hydrophyllum* var. *hydrophilum* (Suisun thistle) and *Cordylanthus mollis* spp. *mollis* (Soft bird's beak) from the San Francisco Bay area of California. Office of the Federal Register, National Archives and Records Administration, Washington, D.C. **62** (224, Thursday November 20): 61916–61923.

Fridriksson, S., and B. Magnusson. 1992. Development of the ecosystem on Surtsey with references to Anak Krakatau. GeoJournal **28**:287–291.

Goldschmidt, T. 1996. Darwin's dreampond. Drama in Lake Victoria. Massachusetts Institute of Technology Press, Cambridge, Massachusetts, USA.

Gosling, M. 1989. Extinction to order. New Scientist **121**: 44–49.

Gray, A. 1879. The pertinacity and predominance of weeds. American Journal of Science and Arts **18**:161–167.

Gray, A. J., and P. E. M. Benham, editors. 1990. *Spartina anglica*—a research review. ITE research publication no. 2. Natural Environment Research Council, Institute of Terrestrial Ecology, London, UK.

Greathead, D. J. 1968. Biological control of *Lantana*—a review and discussion of recent developments in East Africa. PANS **14**:167–175.

Groombridge, B., editor. 1992. Global biodiversity. Status of the Earth's living resources. Chapman and Hall, London, UK.

Hajek, A. E., R. A. Humber, and J. S. Elkinton. 1995. Mysterious origins of *Entomophaga maimaiga* in North America. American Entomologist **41**:31–42.

Harper, J. L. 1965. Establishment, aggression and cohabitation. Pages 243–265 *in* H. G. Baker and G. L. Stebbins, editor. The genetics of colonizing species. Academic, New York, New York, USA.

Harper, J. L. 1982. After description. Pages 11–25 *in* E. I. Newman, editor. The plant community as a working mechanism. British Ecological Society Special Publications, No. 1. Blackwell Scientific, Oxford, UK.

Heywood, V. H. 1989. Patterns, extents and modes of invasions by terrestrial plants. Pages 31–60 *in* J. A. Drake, F. di Castri, R. H. Groves, F. J. Kruger, H. A. Mooney, M. Rejmanek, and M. Williams, editors. Biological invasions: a global perspective. Wiley, New York, New York, USA.

Hill, D. S., and J. M. Waller. 1982. Pests and diseases of tropical crops, Volume I: principles and methods of control. Longman, Essex, UK.

Hoelmer, K. A., and J. K. Grace. 1989. Citrus blackfly. Pages 147–165 *in* D. A. Dahlsten and R. Garcia, editors. Eradication of exotic pests. Yale University Press, New Haven, Connecticut, USA.

Holm, L., J. Doll, E. Holm, J. Pancho, and J. Herberger. 1997. World weeds: natural histories and distribution. Wiley, New York, New York, USA.

Howarth, F. G. 1991. Environmental impacts of classical biological control. Annual Review of Entomology **36**:485–509.

Huelma, C. C., K. Moody, and T. W. Mew. 1996. Weed seeds in rice seed shipments: a case study. International Journal of Pest Management **42**:147–150.

Jenkins, P. 1996. Free trade and exotic species introductions. Pages 145–147 *in* O. T. Sandlund, P. J. Schei, and A. Viken,

editors. Proceedings, Norway/UN Conference on Alien Species. Directorate for Nature Management and Norwegian Institute for Nature Research, Trondheim, Norway.

Kaiser, J. 1999. Stemming the tide of invading species. Science **285**:1836–1841.

Kaufmann, J. B., D. L. Cummings, and D. E. Ward. 1998. Fire in the Brazilian Amazon: 2. biomass, nutrient pools, and losses in cattle pastures. Oecologia **113**:415–427.

Kaufmann, J. B., D. L. Cummings, D. E. Ward, and R. Babbitt. 1995. Fire in the Brazilian Amazon: 1. biomass, nutrient pools, and losses in slashed primary forests. Oecologia **104**:397–408.

King, W. B. 1985. Island birds: will the future repeat the past? Pages 3–15 *in* P. J. Moors, editor. Conservation of island birds. International Council for Bird Preservation. Cambridge University Press, Cambridge, UK.

Kruger, F. J., D. M. Richardson, and B. W. van Wilgen. 1986. Processes of invasion by alien plants. Pages 145–155 *in* I. A. W. Macdonald, F. J. Kruger, and A. A. Ferrar, editors. The ecology and management of biological invasions in southern Africa. Oxford University Press, Cape Town, South Africa.

Lawton, J. H. 1987. Are there assembly rules for successional communities? Pages 225–244 *in* A. J. Gray, M. J. Crawley, and P. J. Edwards, editors. Colonization, succession and stability. Symposium of the British Ecological Society, volume 26. Blackwell, Oxford, UK.

Lever, C. 1979. They dined on eland. Quiller, London, UK.

Long, J. L. 1981. Introduced birds of the world. David and Abbott, Newton, UK.

Lonsdale, W. M. 1994. Inviting trouble: introduced pasture species in Northern Australia. Australian Journal of Ecology **19**:345–354.

Lonsdale, W. M. 1999. Global patterns of plant invasions and the concept of invasibility. Ecology **80**:1522–1536.

Louda, S. M., D. Kendall, J. Connor, and D. Simberloff. 1997. Ecological effects of an insect introduced for the biological control of weeds. Science **277**:1088–1090.

Lousley, J. E. 1953. The recent influx of aliens into the British flora. Pages 140–159 *in* J. E. Lousley, editor. The changing flora of Britain. Botanical Society of the British Isles. Arbroath, London, UK.

Luken, J. O., and J. W. Thieret, editors. 1997. Assessment and management of plant invasions. Springer-Verlag, New York, New York, USA.

Mack, R. N. 1981. Invasion of *Bromus tectorum* L. into western North America: an ecological chronicle. Agro-Ecosystems **7**:145–165.

Mack, R. N. 1985. Invading plants: their potential contribution to population biology. Pages 127–142 *in* J. White, editor. Studies on plant demography: John L. Harper festschrift. Academic Press, London, UK.

Mack, R. N. 1989. Temperate grasslands vulnerable to plant invasion: characteristics and consequences. Pages 155–179 *in* J. A. Drake, H. A. Mooney, F. di Castri, R. H. Groves, F. J. Kruger, M. Rejmanek, and M. Williamson, editors. Biological invasions: a global perspective. Wiley, Chichester, UK.

Mack, R. N. 1995. Understanding the processes of weed invasions: the influence of environmental stochasticity. Pages 65–74 *in* C. Stirton, editor. Weeds in a changing world. British Crop Protection Council, Symposium Proceedings No. 64, Brighton, UK.

Mack, R. N. 1996. Plant invasions: early and continuing expressions of global change. Pages 205–216 *in* B. Huntley, W. Cramer, A. V. Morgan, H. C. Prentice, and J. R. M. Allen, editors. Past and future rapid environmental changes: the spatial and evolutionary responses of terrestrial biota. Springer-Verlag, Berlin, Germany.

Mack, R. N. *In press.*Assessing the extent, status and dynamism of plant invasions: current and emerging approaches. *In* H. A. Mooney and R. J. Hobbs, editors. The impact of global change on invasive species. Island, Covelo, California, USA.

McArthur, E. D., A. C. Blauer, and R. Stevens. 1990. Forage Kochia competition with cheatgrass in central Utah. Pages 56–65 *in* Proceedings—Symposium on cheatgrass invasion, shrub die-off, and other aspects of shrub biology and management. U.S. Forest Service General Technical Report **INT-276**.

McDowall, R. M. 1994. Gamekeepers for the nation: the story of New Zealand's acclimatisation societies 1861–1990. Canterbury University Press, Christchurch, New Zealand. .

McNeill, W. H. 1976. Plagues and peoples. Anchor, New York, New York, USA.

Meinesz, A. 1999. Killer algae. University of Chicago Press, Chicago, Illinois, USA.

Merrill, L. D. 1989. Citrus canker. Pages 184–195 *in* D. L. Dahlsten and R. Garcia, editors. Eradication of exotic pests. Yale University Press, New Haven, Connecticut, USA.

Messenger, P., and R. van den Bosch. 1971. The adaptability of introduced biological control agents. Pages 68–92 *in* C. B. Huffaker, editor. Biological control. Plenum, New York, New York, USA.

Moody, M., and R. N. Mack. 1988. Controlling the spread of plant invasions: the importance of nascent foci. Journal of Applied Ecology **25**:1009–1021.

Moran, C., and H. G. Zimmerman. 1991. Biological control of jointed cactus, *Opuntia aurantiaca* (Cactaceae), in South Africa. Agriculture, Ecosystems and Environment **37**:5–27.

Mountainspring, S., and J. M. Scott. 1985. Interspecific competition among Hawaiian forest birds. Ecological Monographs **55**:219–239.

Moyle, P. B. 1986. Fish introductions into North America: patterns and ecological impact. Pages 27–43 *in* H. A. Mooney and J. A. Drake, editors. Ecology of biological invasions of North America and Hawaii. Wiley, New York, New York, USA.

National Research Council. 1986. Pesticide resistance, strategies and tactics for management. Committee on Strategies for the Management of Pesticide Resistant Pest Populations, Board on Agriculture. National Academy Press, Washington, D.C., USA.

Naylor, R. 1996. Invasions in agriculture: assessing the cost of the Golden Apple Snail in Asia. Ambio **25**:443–448.

Nelson, T. C. 1955. Chestnut replacement in the Southern Highlands. Ecology **36**:352–353.

New Zealand Department of Conservation. 1995. Kaimanawa wild horses plan. Department of Conservation, Wanganui Conservancy, Wanganui, New Zealand.

Odour, G. 1996. Biological pest control and invasives. Pages 116–122 *in* O. T. Sandlund, P. J. Schei, and A. Viken, editors. Proceedings of the Norway/UN Conference on Alien Species. Directorate for Nature Management and Norwegian Institute for Nature Research, Trondheim, Norway.

Osmund, C. B., and L. Monro. 1981. Prickly pear. Pages 194–222 *in* D. J. and S. G. M. Carr, editors. Plants and man in Australia. Academic Press, Sydney, Australia.

Ospina, P. 1998. Eradication and quarantine: two ways to save the islands. World Conservation **4**:44.

Panetta, D., P. Pheloung, W. M. Lonsdale, S. Jacobs, M. Mulvaney, and W. Wright. 1994. Screening plants for weediness: a procedure for assessing species proposed for importation to Australia. A report commissioned by the Australian Weeds Committee. Canberra, Australia.

Pannell, D. J. 1999. Paying for weeds: economics and policies for weeds in extensive land systems. Pages 571–576 *in* D. Eldridge and D. Freudenberger, editors. Proceedings

of the Vl International Rangeland Congress. Volume 2. Townsville, Australia.

Perrins, J., M. Williamson, and A. H. Fitter. 1992. Do annual weeds have predictable characters? Acta Oecologica **13**: 517–533.

Pheloung, P. 1995. Determining the weed potential of new plant introductions to Australia. Agriculture Protection Board Report. Perth, Western Australia.

Pheloung, P. 1999. Preventing the introduction of potential new weeds to Australia. Plant Protection Quarterly **14(3)**: 96–99.

Pimentel, D., L. Lach, R. Zuniga, and D. Morrison. 2000. Environmental and economic costs of nonindigenous species in the United States. BioScience. **50**:53–65.

Porter, S. D., and D. A. Savignano. 1990. Invasion of polygene fire ants decimates native ants and disrupts arthropod community. Ecology **71**:2095–2106.

Randall, J. M., R. R. Lewis, and D. B. Jensen. 1997. Ecological restoration. Pages 205–219 *in* D. Simberloff, D. C. Schmitz, and T. C. Brown, editors. Strangers in paradise. Island, Washington, D.C., USA.

Read, D. J., D. H. Lewis, A. H. Fitter, and I. J. Alexander, editors. 1992. Mycorrhizas in ecosystems. CAB International, Wallingford, Oxon, UK.

Reichard, S., and W. Hamilton. 1997. Predicting invasions of woody plants introduced into North America. Conservation Biology **11**:193–203.

Rejmanek, M., and D. M. Richardson. 1996. What attributes make some plant species more invasive? Ecology **77**:1655–1660.

Rhymer, J., and D. Simberloff. 1996. Extinction by hybridization and introgression. Annual Review of Ecology and Systematics **27**:83–109.

Richardson, D. M., I. A. W. Macdonald, P. M. Holmes, and R. M. Cowling. 1992. Plant and animal invasions. Pages 271–308 *in* R. M. Cowling, editor. The ecology of the fynbos: nutrients, fire and diversity. Oxford University Press, Oxford, UK.

Ridley, H. N. 1930. The dispersal of plants throughout the world. L. Reeve, Ashford, Kent, UK.

Ring, R. 1995. The West's fisheries spin out of control. High Country News **27(17)**:1–6.

Roane, M. K., G. J. Griffin, and J. R. Elkins. 1986. Chestnut blight, and other *Endothia* diseases, and the genus Endothia. American Phytopathological Society, St. Paul, Minnesota, USA.

Roberto, P. 1995. The cat rescue movement vs. wildlife defenders. California Coast and Ocean **11(2)**:31–40.

Rodda, G. H., T. H. Fritts, and P. J. Conry. 1992. Origin and population growth of the brown tree snake, *Boiga irregularis*, on Guam. Pacific Science **46**:46–57.

Roy, J. 1990. In search of the characteristics of plant invaders. Pages 335–352 *in* F. di Castri, A. J. Hansen, and M. Debussche, editors. Biological invasions in Europe and the Mediterranean Basin. Kluwer, Dordrecht, The Netherlands.

Rozhnov, V. V. 1993. Extinction of the European mink: an ecological catastrophe or natural process? Lutreola **1**:10–16.

Ruesink, J. L., I. M. Parker, M. J. Groom, and P. M. Kareiva. 1995. Reducing the risks of nonindigenous species introductions—guilty until proven innocent. Bioscience **45(7)**: 465–477.

Salisbury, E. 1961. Weeds and aliens. Collins, London, UK.

Sandlund, O. T., P. J. Schei, and A. Viken, editors. 1996. Proceedings of the Norway/UN Conference on alien species. Directorate for Nature Management and Norwegian Institute for Nature Research, Trondheim, Norway.

Savidge, J. 1987. Extinction of an island forest avifauna by an introduced snake. Ecology **68**:660–668.

Schardt, J. D. 1997. Maintenance control. Pages 229–243 *in* D. Simberloff, D. C. Schmitz, and T. C. Brown, editors. Strangers in paradise. Island, Washington, D.C., USA.

Schmitz, D. C., D. Simberloff, R. H. Hofstetter, W. Haller, and D. Sutton. 1997. The ecological impact of nonindigenous plants. Pages 39–61 *in* D. Simberloff, D. C. Schmitz, and T. C. Brown, editors. Strangers in paradise. Island Press, Washington, D.C., USA.

Semken, H. A. 1983. Holocene mammalian biogeography and climatic change in the Eastern and Central United States. Pages 182–207 *in* H. E. Wright, editor. Late-Quaternary environments of the United States. Volume 2. The Holocene. University of Minnesota Press, Minneapolis, Minnesota, USA.

Seymour, F. C. 1969. The flora of New England. Tuttle, Rutland, Vermont, USA.

Shukla, J., C. Nobre, and P. Sellers. 1990. Amazon deforestation and climatic change. Science **247**:1322–1325.

Simberloff, D. 1986. Introduced insects: a biogeographic and systematic perspective. Pages 3–26 *in* H. A. Mooney and J. A. Drake, editors. Ecology of biological invasions of North America and Hawaii. Wiley, New York, New York, USA.

Simberloff, D. 1988. The contribution of population and community biology to conservation science. Annual Review of Ecology and Systematics **19**:473–511.

Simberloff, D. 1989. Which insect introductions succeed and which fail? Pages 61–75 *in* J. A. Drake, H. A. Mooney, F. di Castri, R. H. Groves, F. J. Kruger, M. Rejmanek, and M. Williamson, editors. Biological invasions: a global perspective. Wiley, Chichester, UK.

Simberloff, D. 1995. Why do introduced species appear to devastate islands more than mainland areas? Pacific Science **49**:87–97.

Simberloff, D. 1997. Eradication. Pages 221–228 *in* D. Simberloff, D. C. Schmitz, and T. C. Brown, editors. Strangers in paradise. Island, Washington, D.C., USA.

Simberloff, D., D. C. Schmitz, and T. C. Brown. 1997. Why we should care? Pages 359–367 *in* D. Simberloff, D. C. Schmitz, and T. C. Brown, editors. Strangers in paradise. Island, Washington, D.C., USA.

Simberloff, D., and P. Stiling. 1996. How risky is biological control? Ecology **77**:1965–1974.

Smith, C. S., W. M. Lonsdale, and J. Fortune. 1999. When to ignore advice: invasion predictions and decision theory. Biological Invasions **1(1)**:89–96.

Soulé, M. E. 1992. The social and public health implications of global warming and the onslaught of alien species. Journal of Wilderness Medicine **3**:118–127.

Storrs, M. J., A. Kenyon, and W. M. Lonsdale. 1999. Strategic weed management for the aboriginal lands of the Top End. Pages 402–407 *in* R. C. H. Shepherd, editor. Proceedings of the Eleventh Australian Weeds Conference, Melbourne, Australia.

Strong, D. R., J. H. Lawton, and R. Southwood. 1984. Insects on plants. Harvard University Press, Cambridge, Massachusetts, USA.

Symanski, R. 1996. Dances with horses: lessons from the environmental fringe. Conservation Biology **10(3)**:708–712.

Thellung, A. 1911–1912. La flore adventice de Montpellier. Mémoires de la Société Nationale des Sciences Naturelles et Mathemaiques de Cherbourg **38**:57–728.

Thompson, G. M. 1922. The naturalization of animals and plants in New Zealand. Cambridge University Press, Cambridge, UK.

Thompson, J. D. 1991. The biology of an invasive plant. BioScience **41**:393–401.

U.S. Congress. 1993. Harmful nonindigenous species in the United States. Office of Technology Assessment, OTA-F-

565. U.S. Congress Government Printing Office. Washington, D.C., USA.

van Riper, C., S. G. van Riper, M. L. Goff, and M. Laird. 1986. The epizootiology and ecological significance of malaria in Hawaiian land birds. Ecological Monographs **56**: 327–344.

van Wilgen, B. W., R. M. Cowling, and C. J. Burgers. 1996. Valuation of ecosystem services. Bioscience **46**:184–189.

Veitch, C. R., and B. D. Bell. 1990. Eradication of introduced animals from the islands of New Zealand. Pages 137–146 *in* D. R. Towns, C. H. Daugherty, and I. A. E. Atkinson, editors. Ecological restoration of New Zealand Islands. Department of Conservation, Wellington, New Zealand.

Veltman, C. J., S. Nee, and M. J. Crawley. 1996. Correlates of introduction success in exotic New Zealand birds. American Naturalitst **147**:542–557.

Vitousek, P. M. 1990. Biological invasions and ecosystem process—towards an integration of population biology and ecosystem studies. Oikos **57**:7–13.

Vitousek, P. M., C. M. D'Antonio, L. L. Loope, and R. Westbrooks. 1996. Biological invasions as global environmental change. American Scientist **84**:468–478.

Vitousek, P. M., and L. R. Walker. 1989. Biological invasion by *Myrica faya* in Hawai'i: plant demography, nitrogen-fixation, ecosystem effects. Ecological Monographs **59**: 247–265.

Vitousek, P. M., L. R. Walker, L. D. Whiteaker, D. Mueller-Dombois, and P. A. Matson. 1987. Biological invasion by *Myrica faya* alters ecosystem development in Hawaii. Science **238**:802–804.

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1990. Manual of the flowering plants of Hawai'i. Volumes 1 and 2. University of Hawaii Press and Bishop Museum Press, Honolulu, Hawaii, USA.

Walker, B. H., and W. Steffen. 1997. An overview of the implications of global change for natural and managed terrestrial ecosystems. Conservation Ecology **2(2)**:2[online: ⟨http://www.consecol.org/vol1/iss2/art2⟩].

Walters, H. 1979. Vegetation of the Earth. Second edition. Springer, New York, New York, USA.

Wang, J.-T. 1988. The steppes and deserts of the Xizang Plateau (Tibet). Vegetatio **75**:135–142.

Weiss, P. W., and S. J. Milton. 1984. *Chrysanthemonoides monilifera* and *Acacia longifolia* in Australia and South Africa. Pages 159–160 *in* B. Dell, editor. Proceedings of the 4th International Conference on Mediterranean Ecosystems. University of Western Australia, Nedlands, Western Australia.

Welbank, P. J. 1960. Toxin production from *Agropyron repens*. Pages 158–164 *in* J. L. Harper, editor. The biology of weeds; a symposium of the British Ecological Society. Blackwell Scientific, Oxford, UK.

Wells, M. J., R. J. Poynton, A. A. Balsinhas, K. J. Musil, H. Joffe, E. van Hoepen, and S. K. Abbott. 1986. The history of introduction of invasive alien plants to southern Africa. Pages 21–35 *in* I. A. W. Macdonald, F. J. Kruger, and A. A. Ferrar, editors. The ecology and management of biological invasions in Southern Africa. Oxford University Press, Cape Town, South Africa.

Westbrooks, R. 1993. Exclusion and eradication of foreign weeds from the United States by USDA APHIS. Pages 225–241 *in* B. N. McKnight, editor. Biological pollution. Indiana Academy of Science, Indianapolis, Indiana, USA.

Westbrooks, R. G. 1998. Invasive plants: changing the landscape of America: fact book. Federal Interagency Committee for the Management of Noxious and Exotic Weeds, Washington, D.C., USA.

Weste, G., and G. C. Marks. 1987. The biology of *Phytophthora cinnamomi* in Australasian forests. Annual Review of Phytopathology **25**:207–229.

Williams, D. F., editor. 1994. Exotic ants. Biology, impact, and control of introduced species. Westview Press, Boulder, Colorado, USA.

Williamson, M. 1996. Biological invasions. Chapman and Hall, London, UK.

Wodzicki, K. 1965. The status of some exotic vertebrates in the ecology of New Zealand. Pages 425–458 *in* H. G. Baker and G. L. Stebbins, editors. The genetics of colonizing species. Academic, New York, New York, USA.

World Health Organization. 1993. The control of schistosomiasis. WHO Technical Report Series 830. Geneva, Switzerland.

Zohary, D., and M. Hopf. 1993. Domestication of plants in the Old World. Second edition. Clarendon Press, Oxford, UK.

Attachment 14

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More press releases

For Immediate Release, April 9, 2015

Contact: Collette Adkins, (651) 955-3821

Western Pond Turtle Moves Toward Endangered Species Act Protection

Turtle Battling Steep Declines in California, Oregon, Washington

SACRAMENTO, Calif.— In response to a 2012 petition by the Center for Biological Diversity and several renowned scientists and herpetologists, the U.S. Fish and Wildlife Service announced today that Endangered Species Act protection may be warranted for the western pond turtle. The agency will now conduct a one-year status review on the turtle, which faces declines of up to 99 percent in some areas, including Oregon's Willamette Valley.

"The Endangered Species Act is the most powerful tool available to save western pond turtles, so I'm really happy that these amazing reptiles are a step closer to the protection they so desperately need," said Collette Adkins, a Center biologist and lawyer who works to protect reptiles and amphibians. "Western pond turtles are integral to the wild places where they live. Losing them would impoverish those places and our own connection with the natural world."

Western pond turtle photo courtesy California Department of Water Resources. This photo is available for media use.

Western pond turtles are declining in abundance rangewide, especially in the northernmost portion and the southern third of the range. The animals are listed as state endangered in Washington, sensitive/critical in Oregon, and a species of special concern in California. Although habitat destruction is one of the biggest threats to the turtle, none of these state laws provides effective habitat protection.

"Threats like habitat destruction from urbanization and agriculture are driving western pond turtles toward extinction," said Adkins. "Much-needed federal protection of these turtles would help ensure that rivers and wetlands across the West Coast are protected, both for the turtles and for people."

Today's finding responds to a 2012 petition that sought protection for the turtle and 52 other amphibians and reptiles found across the country — the largest ever petition focused on protection of amphibians and reptiles. The Fish and Wildlife Service must next issue a "12-month finding" on the turtle that will propose protection under the Endangered Species Act, reject protection under the Act or add the turtle to the candidate waiting list for protection.

Background
Western pond turtles are found from western Washington south to northwestern Baja California. The name "pond" turtle is something of a misnomer because this species more frequently lives in rivers and spends a lot of time in terrestrial habitats. Western pond turtles are highly opportunistic eaters and will consume almost anything they can catch and overpower.

In June of 2014, the Center for Biological Diversity notified the U.S. Fish and Wildlife Service of new research revealing that the western pond turtle is actually at least two species, each of which is therefore more endangered than previously thought. According to that study, all populations north of the San Francisco Bay area and populations from the Central Valley north (including the apparently introduced Nevada population) are now known as Emys marmorata. Turtles in the southern portions of the range — the central coast range south of the San Francisco Bay and the Mojave River — are described as Emys pallida. Turtles from Baja California are tentatively also considered Emys pallida,but these animals may represent another distinct species pending results from additional analysis.

An upper respiratory disease epidemic in Washington in 1990 left a total population of fewer than 100 western pond turtles in the state. They are essentially extirpated in the lower Puget Sound, and only two populations remain in the Columbia River Gorge. In the Willamette Valley in Oregon, western pond turtles appear to have declined to a level that represents roughly 1 percent of historic levels. In California's Central Valley, where most of the natural habitat has been eliminated, surveys detected turtles at only 15 of 55 sites, with sizable populations only at five sites. Pond turtles from Southern California are in precipitous decline, with few stable, reproducing populations known between Los Angeles and the Mexican border.

The Center for Biological Diversity is a national, nonprofit conservation organization with more than 825,000 members and online activists dedicated to the protection of endangered species and wild places.

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Go back

June 10, 2014

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Re: New Study Splits Western Pond Turtles into Two Species

On behalf of the Center for Biological Diversity, we are writing to inform the U.S. Fish and Wildlife of a study published last month that splits the western pond turtle into two species:

> Spinks, P.Q, R.C. Thomson, and H.B. Shaffer. 2014. The advantages of going large: genome-wide SNPs clarify the complex population history and systematics of the threatened western pond turtle. Molecular Ecology 23: 2228–2241.

Using multiple analytical methods and data sets, the researchers revised the taxonomy of the western pond turtle to identify two new species. All populations north of the San Francisco Bay area and populations from the Central Valley north (including the apparently introduced Nevada population) are now known as *Emys marmorata*. Turtles in the southern portions of their range — the central coast range south of the San Francisco Bay and including the Mojave River — are known as *Emys pallida*. Turtles from Baja California are tentatively considered *Emys pallida* but these animals may represent another distinct species pending results from additional analysis.

These newly identified species are even more endangered than the previously recognized singular entity. As such, this new study reaffirms the need to provide Endangered Species Act protection for western pond turtles.

On July 11, 2012, the Center for Biological Diversity submitted a petition to list the western pond turtle and 52 other amphibian and reptiles species. The petition asks the FWS to protect six turtles, seven snakes, two toads, four frogs, 10 lizards and 24 salamanders under the ESA. A copy of the petition, along with a list of the petitioned species, is available here: http://www.biologicaldiversity.org/campaigns/amphibian_conservation/pdfs/Mega_herp_petition_7-9-2012.pdf. Backed by hundreds of scientific articles, the 450-page petition details the status of, and threats to, the petitioned animals, demonstrating the urgent need for their federal protection.

Western pond turtles and the other petitioned species are at risk and deserve a prompt status review by the U.S. Fish and Wildlife Service. Please add this new study – which is attached to this letter – to your file of best available science on western pond turtles. Feel free to contact us with any questions or concerns.

Sincerely,

_____

Collette L. Adkins Giese
Amphibian and Reptile Staff Attorney
Center for Biological Diversity

D. Noah Greenwald
Endangered Species Program Director
Center for Biological Diversity

Attachment 15

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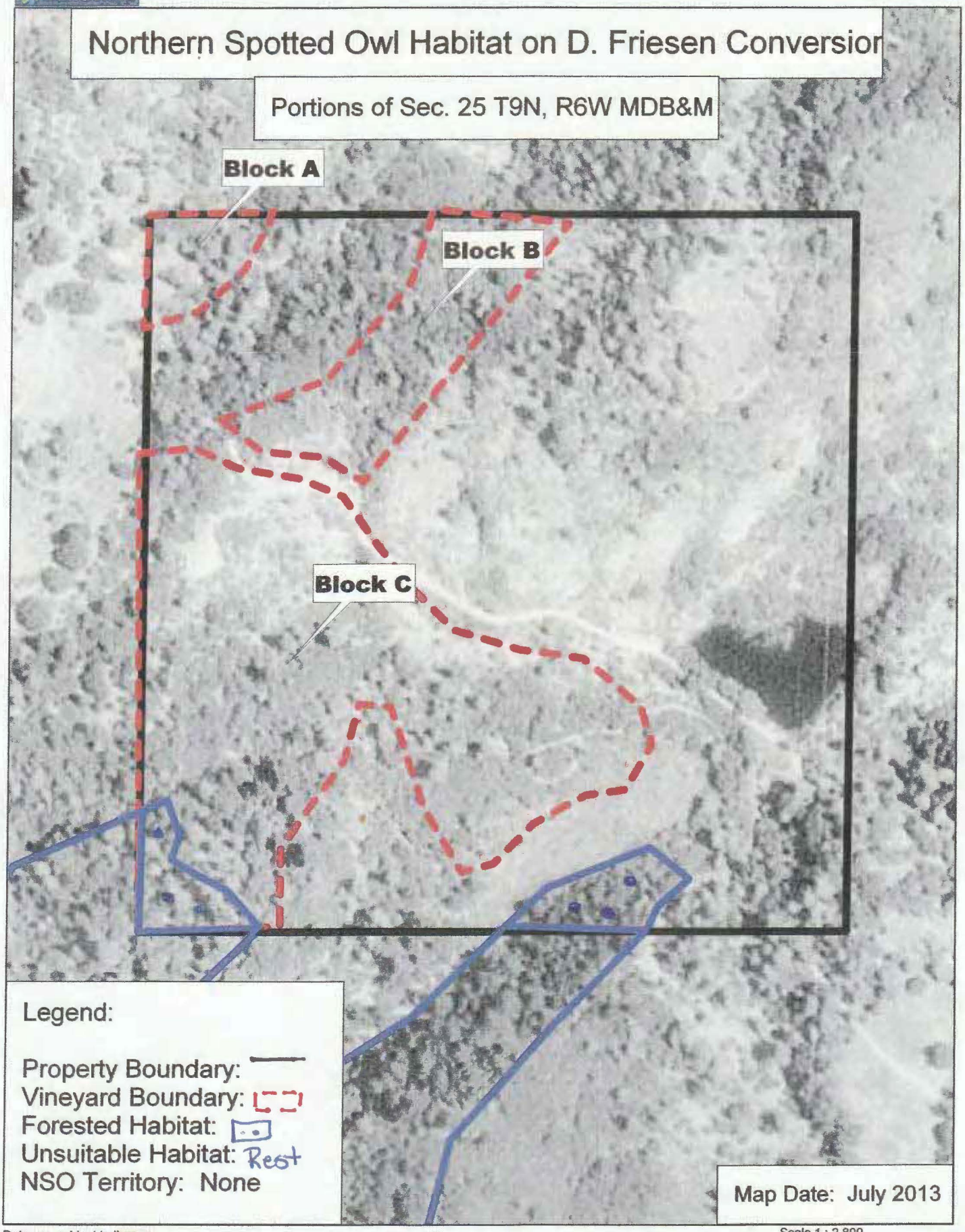
Northern Spotted Owl Habitat on D. Friesen Conversion

Portions of Sec. 25 T9N, R6W MDB&M



Legend:

Property Boundary:
Vineyard Boundary:
Forested Habitat:
Unsuitable Habitat: Rest
NSO Territory: None

Map Date: July 2013

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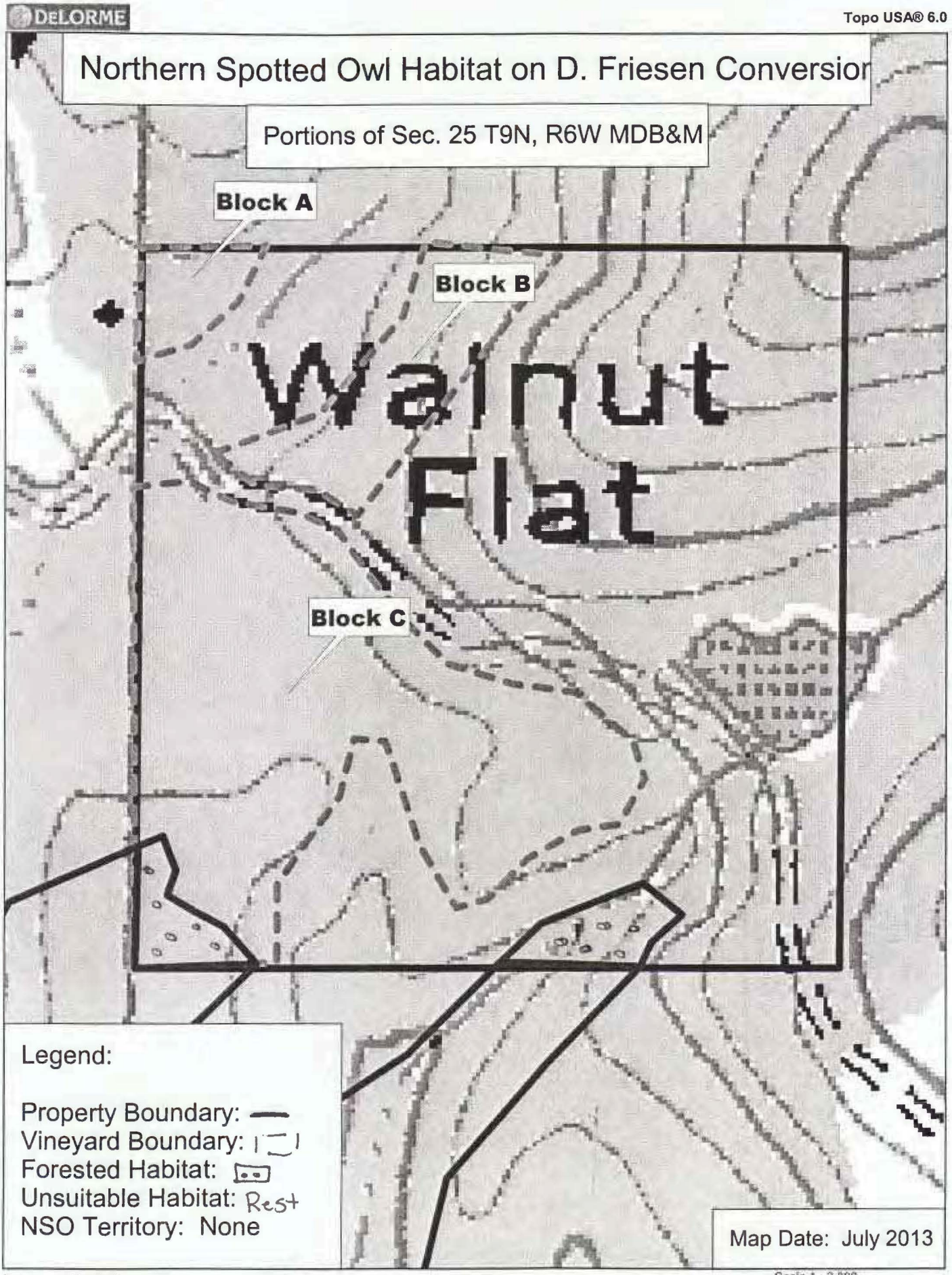
MN (14.2°E)

Scale 1 : 2,800
1" = 233.3 ft
Data Zoom 16-2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Northern Spotted Owl Habitat on D. Friesen Conversion
Portions of Sec. 25 T9N, R6W MDB&M
Block A
Block B
Walnut Flat
Block C
Legend:
Property Boundary:
Vineyard Boundary:
Forested Habitat:
Unsuitable Habitat: Rest
NSO Territory: None
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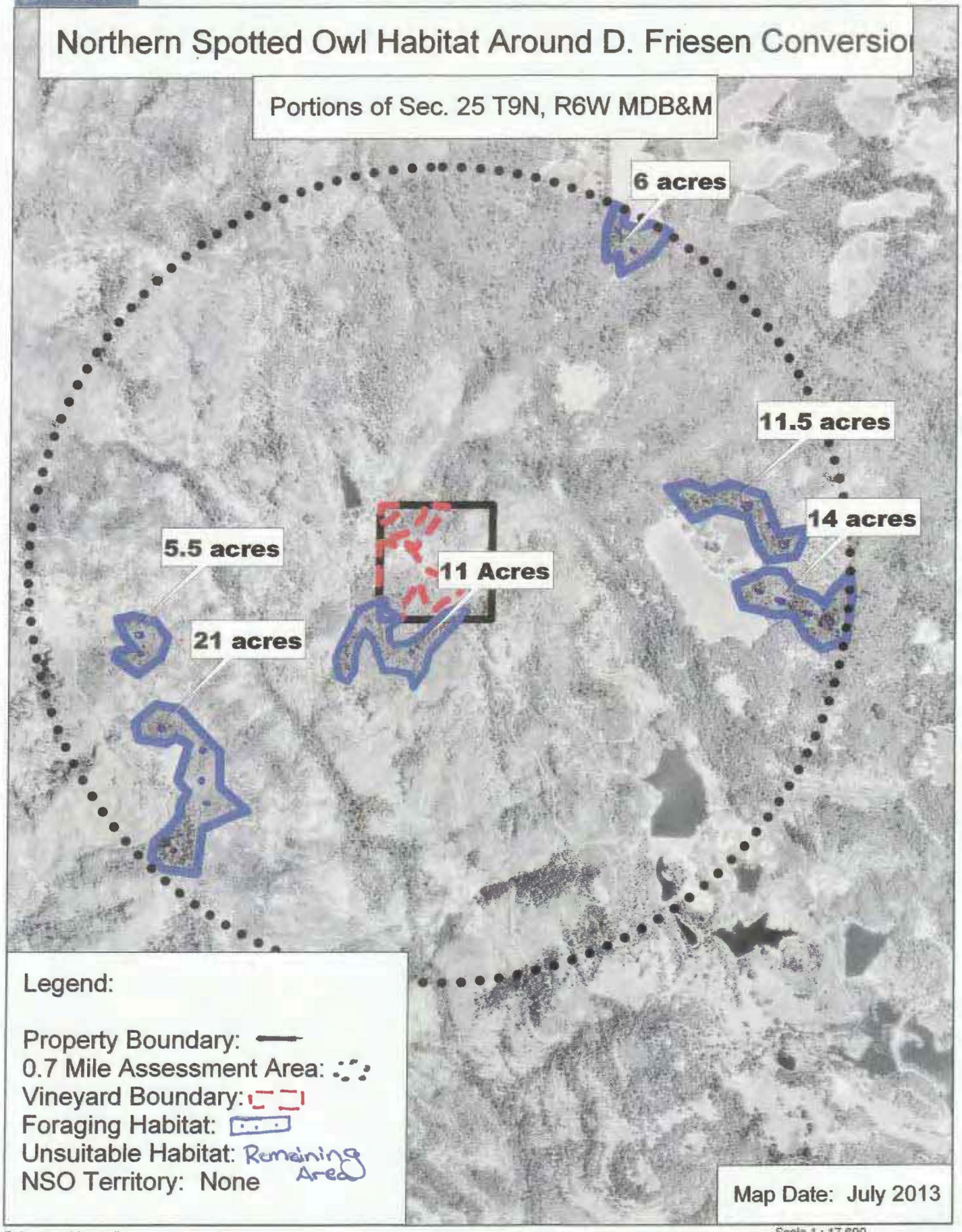
TN
MN (14.2°E)
Scale 1 : 2,800
1" = 233.3 ft
Data Zoom 16-2

DELORME

Topo USA® 6.0

Northern Spotted Owl Habitat Around D. Friesen Conversio

Portions of Sec. 25 T9N, R6W MDB&M



Legend:

Property Boundary:
0.7 Mile Assessment Area:
Vineyard Boundary:
Foraging Habitat:
Unsuitable Habitat: Remaining Area
NSO Territory: None

Map Date: July 2013

Data use subject to license.
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www.delorme.com

TN
MN (14.2°E)

Scale 1 : 17,600
1" = 1,466.7 ft
Data Zoom 13-5

Attachment 16

AFTER RECORDING RETURN TO:
Murphy, Pulice, Associates, Inc.
710 [illegible] Sansome Street
San Francisco, California 94111

VOL 933 PAGE 124

933-124

EASEMENT TO PERMIT BACKWATERS FROM DAMS TO OVERFLOW LAND AND FOR OTHER PURPOSES

Mrs. Pearl Friesen, a single woman (Grantor), hereby grants to the Silverado Lakes Water Company, a California corporation (Grantee), the following permanent easements in and over the property described in Exhibits A and B attached hereto and made a part hereof:

(a) The right, at any time, to overflow, flood, and cover said land up to the maximum elevations stated in Exhibit A with backwaters created by the erection and operation of Granite Lake Dam, Newton Dam, Whitehead Dam and Red Lake Dam, which are located across tributaries of Conn Creek in Napa County, California.

(b) The right to enter the land described in Exhibit A and all land within a twenty (20) foot horizontal distance from said land for the purpose of operating, maintaining, repairing or replacing the dams and reservoirs.

(c) The right to enter the land described in Exhibit B hereto for the purpose of reaching all lands or interests in land owned by Grantee located within the exterior boundaries of the property described in Exhibit B. This right of entry shall be limited to the use of established access roads, the location or alignment of which may be altered by Grantor from time to time; provided that Grantor shall at all times provide adequate access roads to all lands or interests in land owned by Grantee. The limitations of this right of entry shall not be effective as to any lands or interests in

B 33361

RECORDED AT REQUEST OF
[illegible] CO.
IN OFFICIAL RECORDS OF
NAPA COUNTY, CALIF.
11:25 A.M. APR 11 1974
ELEANOR E. KIMBROUGH
COUNTY RECORDER

9.00

1..... C..... 2.....

land for which adequate access roads are not provided. Any access roads provided solely for the use of Grantee shall be maintained at Grantee's expense.

(d) In the interest of public health and sanitation, and in order to maintain the yield of the watershed which supplies water to the four reservoirs described in Exhibit A hereto:

(1) No use shall be made of that portion of the property described in Exhibit B hereto which comprises said watershed other than for grazing, irrigated pasture and hay raising, horseback riding, hiking, picknicking, and similar agricultural or recreational open space uses which shall not contaminate, defile or otherwise pollute the water supply of the Silverado Lakes Water Company;

(2) No use shall be made of those lakes within the property described in Exhibit B hereto which are known as Cooksley, Deer, Doe and Fawn Lakes which will contaminate, defile, or otherwise pollute the water supply of the Silverado Lakes Water Company; and

(3) No water shall be diverted to storage in Cooksley, Deer, Doe or Fawn Lakes during any year until the four lakes described in Exhibit A hereto have been filled to capacity.

The covenants contained in this paragraph (d) shall run with the land of grantor and shall bind all those who may hereafter own the land within the watershed which supplies water to the four reservoirs described in Exhibit A hereto, whether by purchase, devise or descent.

THE UNDERSIGNED GRANTOR(S) DECLARE(S)
DOCUMENTARY TRANSFER TAX IS $ NO TAX DUE
( ) COMPUTED ON FULL VALUE OF PROPERTY, OR
( ) COMPUTED ON FULL VALUE LESS VALUE OF LIENS AND ENCUMBRANCES REMAINING AT TIME OF SALE.
( ) UNINCORPORATED AREA; ( ) CITY OF

Pearl Friesen
PEARL FRIESEN

Nancy Jo -2-

VOL 933 PAGE 721

STATE OF WASHINGTON,
County of Walla Walla } ss.

I, the undersigned, a Notary Public in and for the above-named county and state, do hereby certify that on this 7th day of December 19 73, personally appeared before me Pearl Friesen

to me known to be the individual described in and who executed the within instrument, and acknowledged that she signed and sealed the same as her free and voluntary act and deed, for the uses and purposes therein mentioned.

Given under my hand and official seal the day and year last above written.

Ralph L. Jones

Notary Public for State of Washington.
Residing at College Place

INDIVIDUAL ACKNOWLEDGEMENT

My commission expires: April 18, 1975

OVERFLOW AND FLOOD EASEMENT

All that real property situate in the County of Napa, located in portions of Sections 26 and 36 of T9N, R6W, MDB&M, and a portion of Section 31 of T9N, R5W, MDB&M, and being more particularly described as follows:

RED LAKE

All lands below elevation 1870 Mean Sea Level Datum which lie northeasterly of and are contiguous to that certain earth embankment owned by Grantee commonly known as "Red Lake Dam."

GRANITE LAKE

All lands below elevation 1930 Mean Sea Level Datum which lie northerly of and are contiguous to that certain earth embankment owned by Grantee commonly known as "Granite Lake Dam."

LAKE NEWTON

All lands below elevation 1898 Mean Sea Level Datum which lie northerly of and are contiguous to that certain earth embankment owned by Grantee commonly known as "Newton Dam."

LAKE WHITEHEAD

All lands below elevation 1865 Mean Sea Level Datum which lie northerly of and are contiguous to that certain earth embankment owned by Grantee commonly known as "Whitehead Dam."

Exhibit A

EXHIBIT "B"

DESCRIPTION OF THE WATERSHED AREA
OF RED LAKE, GRANITE LAKE, NEWTON LAKE,
AND LAKE WHITEHEAD AND LANDS REQUIRED FOR ACCESS

All that real property situate in the County of Napa, State of California, described as follows:

Parcel 1 - In Section 25, T. 9 N., R. 6 W., M.D.B. & M.:

The Southeast quarter of the Northwest quarter and the South half of the Southwest quarter; the South half of the Southeast quarter, the Northeast quarter of the Southwest quarter and that portion thereof described as follows:

Commencing in the center of said Section 25; running thence North 970.04 feet; thence South 34° 26' East 2776.43 feet to the North line of the South half of the Southeast quarter of said Section 25, thence West to the Northwest corner of the South half of the Southeast quarter; thence North to the point of commencement.

Parcel 2 - In Section 36, T. 9 N., R. 6 W., M.D.B. & M., the NE 1/4.

PARCEL THREE: Lots 1, 2, and 3, the Southeast quarter of the Northwest quarter, the Southwest quarter of the Southeast quarter and the Southeast quarter of the Southwest quarter of Section 31, Township 9 North, Range 5 West, M.D.B.&M.

EXCEPTING THEREFROM, the following:
(a) The 17 acre tract of land described in the deed to W.A.C. Smith recorded September 19, 1883 in Book 32 of Deeds at page 420, said Napa County Records.

(b) That portion thereof included in the 87.48 acre tract of land described in the deed to Billie Watson and husband recorded October 14, 1970 in Book 837 of Official Records at page 235, said Napa County Records.

PARCEL FOUR: That portion of the Northwest quarter of the Southeast quarter and the Northeast quarter of the Southwest quarter of Section 31, Township 9 North, Range 5 West, M.D.B.&M., lying Westerly of the following described line: Commencing at an 8 inch iron pipe marking the center of said Section 31 and running thence along the fence marking the Easterly boundary of the road commonly referred to as "Haskell Road", the following courses and distances: South 46° 07' East 71.63 feet; South 12° 07' East 119.08 feet; South 33° 53' West

404.85 feet; South 55° 03' West 196.81 feet; South 43° 11' West 239.48 feet; South 55° 01' West 84.58 feet; South 59° 34' West 63.08 feet; South 46° 24' West 50.70 feet; South 10° 49' West 115.50 feet; South 7° 10' West 106.35 feet; South 6° 02' East 95.25 feet; South 39° 18' East 64.40 feet; South 77° 18' East 153.25 feet; South 56° 33' East 53.70 feet; South 42° 05' East 20.01 feet, more or less to a point on the South line of the Northeast quarter of the Southwest quarter of Section 31.

PARCEL FIVE: Commencing at a point on the West line of the La Jota Rancho, where the same is intersected by the line between Townships 8 and 9 North, Range 5 West, M.D.M.; running thence Westerly, along said Township line, 23.74 chains to the Easterly line of a road; thence along the said line of said road, about as follows: South 35° 45' East 2.95 chains, South 10° 45' East 2.44 chains; South 66° 30' East 2.75 chains; South 82° East 2.52 chains South 68° East 1.00 chain; South 46° 45' East 2.22 chains; South 56° East 1.44 chains; South 66° East 2.09 chains; North 89° 45' East 4.63 chains and South 76° 15' East 2.40 chains to the Westerly line of the said La Jota Rancho, and thence following said Rancho Line North 23° East to the point of commencement.

EXCEPTING THEREFROM that portion thereof within the 87.48 acre tract of land described in the deed to Billie Watson and husband recorded October 14, 1970 in Book 837 of Official Records at page 235, said Napa County Records.

PARCEL SIX: That portion of Lot 10 as shown on the Map entitled, Map of the Subdivisions of part of the Liparita Rancho in Section 6, T 8 N, R 5, W Napa Co. Calif., filed August 9, 1910 in Book 2 of Maps page 21 in the office of the County Recorder of said Napa County lying Northeast of a line beginning on the North boundary of said Lot 10, distant 255.8 feet Easterly thereon from the Northwest corner thereof, and extending in a straight line to a point in the East boundary of said Lot 10, distant thereon 180 feet from the Southeast corner thereof.

PARCEL SEVEN: That portion of Lot 11 as shown on the Map entitled "Map of the Subdivisions of Part of the Liparita Rancho in Section 6, T 8 N, R 5, W Napa Co. Cal., filed August 9, 1910 in Book 2 of Maps page 21 in the office of the County Recorder of said Napa County, lying Easterly of the Northern extension of the Eastern line of Tobin Avenue.

PARCEL EIGHT: Being a portion of Lot 18, as shown upon that certain Map entitled, "Map of the Subdivisions of Part of the Liparita Rancho, in Section 6, T. 8 N, R 5 W., Napa Co., Cal", filed August 9, 1910 in Book 2 of Maps at page 21 in the office of the County of Napa, State of California described as follows:

Commencing at the most Western corner of the 0.4 acre tract of land described in the deed to Henry R. Klinger and wife, of record in Book 238 of Official Records, at page 360, said Napa County Records; running thence North 42° 30' West 18 feet to the Western line of the 18 foot Right of Way described in said deed to Klinger and wife; thence North 47° 30' East, along the Western line of said Right of Way, 57.24 feet to an angle therein, being the principal point of beginning of the land herein described; running thence from said principal point of beginning Northwesterly, along the Southwestern line of said 18 foot Right of Way 36 feet; thence South 47° 30' West 39 feet; thence Southeasterly in a direct line to a point on the Western line of said 18 foot Right of Way 39 feet from the principal point of beginning; thence North 47° 30' East 39 feet to the principal point of beginning.

PARCEL NINE: Being a portion of Lot 3 as shown on the Map entitled, "Map of the Subdivision of Lot 41 of the La Jota Rancho, Howell Mountain", filed March 6, 1918 in Book 2 of Maps at page 33 in the Office of the County Recorder of said Napa County, and a portion of Lot 38 of the Aiken Tract, adjoining, described as follows:

Commencing on the Southwestern line of said Lot 3 distant thereon South 66° 45' East 20.0 feet from the most Western corner thereof; running thence North 23° East 270.0 feet; thence South 66° 45' East 155.0 feet; thence North 23° East 20.0 feet; thence North 66° 45' West 155.0 feet; thence North 23° East 258.23 feet to the Southwestern line of White Cottage Road; thence North 56° 45' West along said Southwestern line 20.0 feet more or less to the Northwestern line of said Lot 3; thence South 23° West, along said Northwestern line and the Southwestern extension thereof, 773 feet, more or less, to the Northwestern line of White Cottage Road; thence Northeasterly, along said Northwestern line, to a point that is 20 feet Southeasterly right angle measurement, from the Southwestern extension above referred to; thence North 23° East to the point of commencement.

PARCEL TEN: A portion of Lot 2 as the same is shown on that certain Map entitled, "Map of the Subdivision of Lot 41, La Jota Rancho, Howell Mountain", filed March 6, 1916 in Book 2 of Maps at page 33 in the office of the County Recorder of said Napa County, described as follows:

Commencing at the Northeastern corner of said lot; running thence along the Southern line of the County Road as shown on said Map South 78° 30' West 135.96 feet and North 69° West 28 feet; thence leaving said road South 21° West 46 feet; thence South 58° 52' East 112.39 feet; thence South 79° 28' East, 112.39 feet to the Western line of the County Road on the Eastern line of said Lot 2; thence North 12° 15' West 141.56 feet to the point of commencement.

PARCEL ELEVEN: All easements acquired by Dick R. Friesen in connection with that certain water system owned and operated by him during his lifetime.

It is the intent that said property encloses the watershed area of Red Lake, Granite Lake, Newton Lake, and Lake Whitehead.

Attachment 17

BAY AREA CRITICAL LINKAGES

DRAFT Least Cost Corridor for Mountain Lion (Puma concolor)

Blue Ridge to Marin Coast Connection

In Partnership with the San Francisco Upland Habitat Goals Project

Map Produced by SC Wildlands

BAY AREA CRITICAL LINKAGES

DRAFT Least Cost Corridor for Badger (*Taxidea taxus*)

Blue Ridge to Marin Coast Connection

In Partnership with the San Francisco Upland Habitat Goals Project

Map Produced by SC Wildlands

BAY AREA CRITICAL LINKAGES

DRAFT Least Cost Corridors with Species Overlap

Blue Ridge to Marin Coast Connection

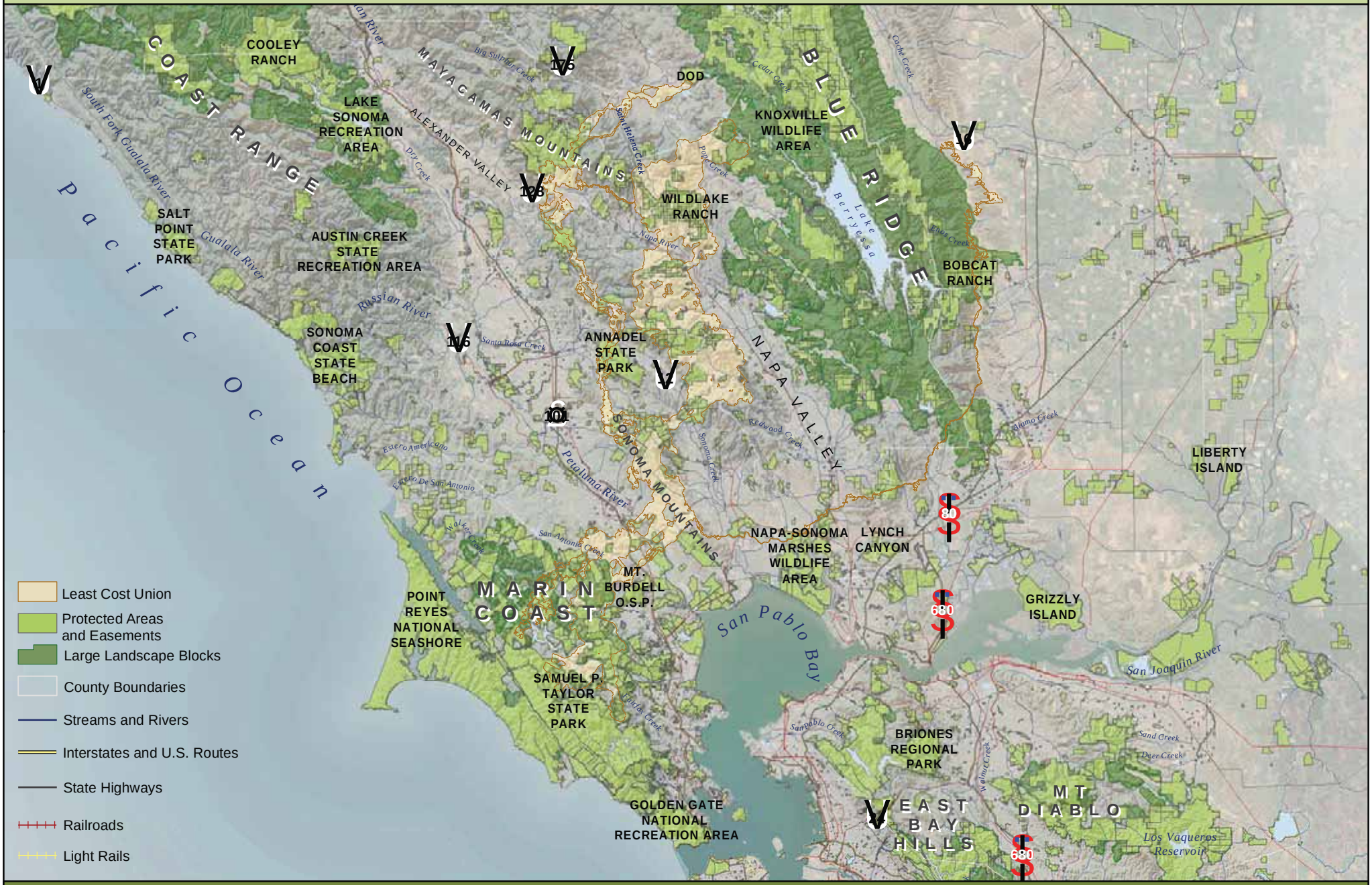
In Partnership with the San Francisco Upland Habitat Goals Project

1:700,000

Map Produced by SC Wildlands

BAY AREA CRITICAL LINKAGES

DRAFT Least Cost Union: Blue Ridge to Marin Coast Connection



In Partnership with the San Francisco Upland Habitat Goals Project

1:700,000

0 10 20 30 Kilometers

0 10 20 Miles

Map Produced by SC Wildlands

BAY AREA CRITICAL LINKAGES

DRAFT Edits to Least Cost Union

Blue Ridge to Marin Coast Connection

In Partnership with the San Francisco Upland Habitat Goals Project

1:700,000

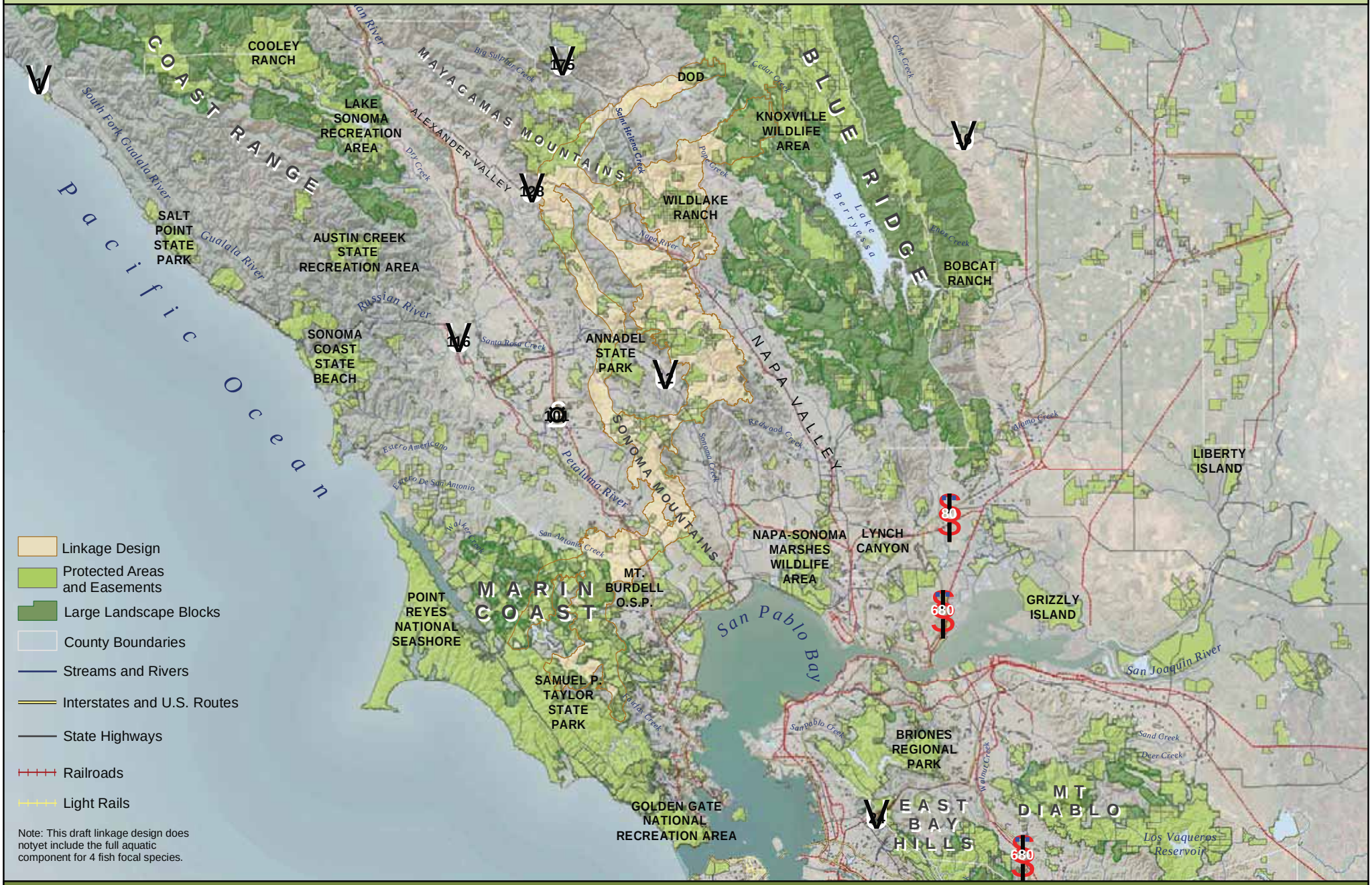
0 5 10 15 Kilometers

0 5 10 Miles

Map Produced by SC Wildlands

BAY AREA CRITICAL LINKAGES

DRAFT Linkage Design: Blue Ridge to Marin Coast Connection



Note: This draft linkage design does notyet include the full aquatic component for 4 fish focal species.

In Partnership with the San Francisco Upland Habitat Goals Project

1:700,000

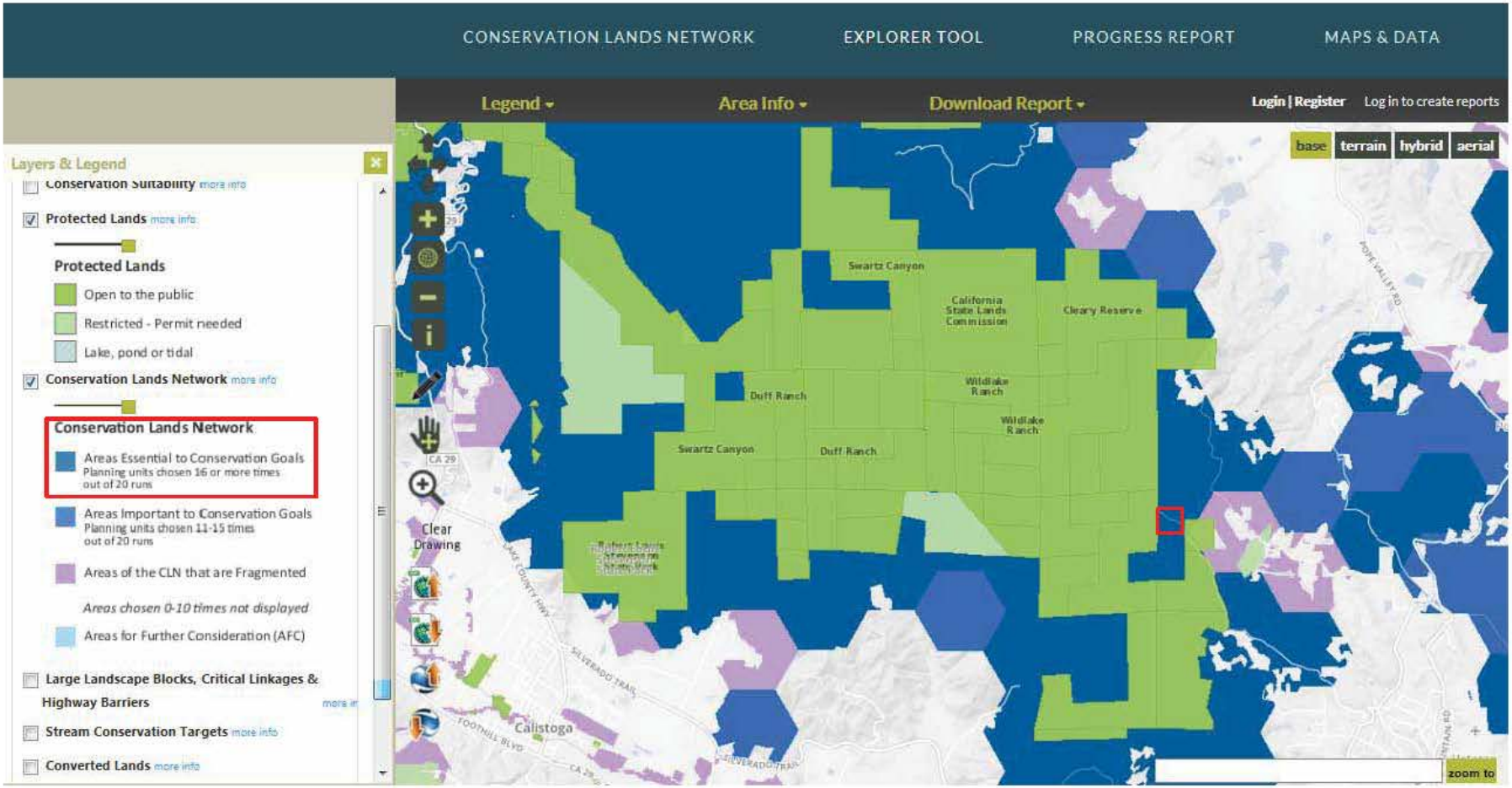
0 5 10 15 Kilometers

0 5 10 Miles

Map Produced by SC Wildlands

Attachment 18

713776.1


CONSERVATION LANDS NETWORK
EXPLORER TOOL
PROGRESS REPORT
MAPS & DATA
Legend
Area Info
Download Report
Login | Register
Log in to create reports
Layers & Legend
Conservation Suitability more info
Protected Lands more info
Protected Lands
Open to the public
Restricted - Permit needed
Lake, pond or tidal
Conservation Lands Network more info
Conservation Lands Network
Areas Essential to Conservation Goals
Planning units chosen 16 or more times out of 20 runs
Areas Important to Conservation Goals
Planning units chosen 11-15 times out of 20 runs
Areas of the CLN that are Fragmented
Areas chosen 0-10 times not displayed
Areas for Further Consideration (AFC)
Large Landscape Blocks, Critical Linkages & Highway Barriers
Stream Conservation Targets more info
Converted Lands more info
base
terrain
hybrid
aerial
Swartz Canyon
California State Lands Commission
Cleary Reserve
Duff Ranch
Wildlake Ranch
Swartz Canyon
Duff Ranch
Clear Drawing
Calistoga
zoom to

Attachment 19

THE CALIFORNIA REPORT (HTTP://WWW.KQED.ORG/RADIO/PROGRAMS/THE-CALIFORNIA-REPORT)

Cooler Temperatures Aid Fire Crews Battling Massive Wildfires

Burned-out vehicles are surrounded by smoldering rubble while firefighters continue to battle the Valley Fire in Middletown, California. (Josh Edelson/AFP/Getty Images)

By KQED News Staff (http://ww2.kqed.org/news/author/kqed)
SEPTEMBER 16, 2015

The Valley Fire has scorched 70,000 acres — about 100 square miles — in three counties north of San Francisco. Containment now stands at 30 percent. Fire officials are hopeful that cooler weather will help them slow the fire's spread. About 13,000 people have been evacuated from their homes. The toll of residences destroyed now stands at just over 600, and hundreds of other structures have also gone up in flames. Nine thousand other structures are still threatened. Rolling updates below ...

Update: 3:00 p.m., Wednesday, Sept. 16: A second life has been claimed by massive wildfires that swept through Northern California this week. The Calaveras County Sheriff has confirmed a fatality resulting from the Butte Fire, according to an update posted on Twitter by Cal Fire public information officer Daniel Berlant. More information is expected soon. The Butte Fire has predominantly impacted Calaveras County, and was 45 percent contained as of the most recent update. So far, the Butte Fire has destroyed just over 400 structures.

Update: 1:30 p.m., Wednesday, Sept. 16:
There are currently 14,000 firefighters across the state of California battling 10 active blazes, Cal Fire spokesman Daniel Berlant said in a Wednesday update. But crews are making progress.

The Valley Fire, which has already been designated as the most destructive wildfire in 2015, has caused one known fatality and scorched about 100 square miles, with more than 600 structures damaged in the blaze. That property toll doesn't include barns or sheds that went up in flames along with homes burnt to the ground.

"When all the other outbuildings are assessed and a full damage assessment is complete, it is likely that this fire will be in the top five most destructive fires (http://www.kqed.org/news/2015/09/16/valley-and-butte-fires-are-among-californias-most-destructive-blazes) that we have seen in our history," Berlant said.

Firefighters are making progress, thanks in part to cooler temperatures — the Valley Fire was 30 percent contained as of Wednesday morning. At the same time, another weather-related factor was working against their efforts. A number of hot spots continue to smolder throughout the fire zone, and these small fiery patches can be reignited by gusty winds. Those powerful gusts can spur flare-ups and threaten to reverse firefighters' progress in bringing blazes under control.

Further to the east, in Calaveras and Amador counties, firefighters were also making progress in gaining control of the Butte Fire, which has scorched 71,780 acres and already ranks as the state's 14th most damaging blaze. The Butte Fire now stands at 45 percent containment.

Throughout the affected areas, thousands of people who have been put up for days at evacuation centers are still waiting to return.

"There are still thousands of residents who have been evacuated from this fire," Berlant said of the Valley Fire. "Many are asking when can they get back home, and we are hoping to get them back just as soon as possible. But you've got to remember, there are a lot of

hazards."

Update 4:15 p.m., Tuesday, Sept. 15: The Valley Fire has caused at least $1 million in damage to California's largest geothermal energy complex.

The fire disabled five cooling towers at The Geysers (http://www.geysers.com/) network of power plants, northwest of Middletown.

Brett Kerr, a spokesman for Calpine, which runs the plant, said the fire may have also left it isolated from the power grid.

"Some of the non-Calpine-owned transmission lines that deliver the power that is produced to the Geysers to the actual market were also damaged, so while there might be the ability to generate capacity and energy at the Geysers, it may not be able to make it to the grid," he said.

Officials who manage the grid say damage at The Geysers will not have a significant impact on the state's energy supply.

Meanwhile, the San Francisco Chronicle is reporting (http://www.sfgate.com/news/article/Valley-Fire-apparently-started-near-home-in-Cobb-6506658.php) investigators are focusing on a burned-out shed in Cobb, where the fire started, in trying to pinpoint the cause of the conflagration.

Update: 2 p.m., Tuesday, Sept. 15:

At this morning's fire briefing, medical officials cautioned firefighters to watch out for signs of stress. A lot of firefighters are local, officials said, and they know plenty of fire victims.

Of course, the worst anxiety is being experienced by those who have had to leave their homes and belongings behind. From KQED health reporter April Dembosky's post on our State of Health blog (http://ww2.kqed.org/stateofhealth/2015/09/15/anxiety-taking-toll-on-fire-evacuees-and-exacerbating-other-health-problems/) today:

Lake County Office of Emergency Services Announcements (https://twitter.com/LAKECOUNTYOES) (https://twitter.com/LAKECOUNTYOES)

2015 California Fire Map (https://www.google.com/maps/d/viewer?mid=zp8nK_5H0MFQ.kzTmU5XK-qJQ&hl=en) (https://www.google.com/maps/d/viewer?mid=zp8nK_5H0MFQ.kzTmU5XK-qJQ&hl=en)

> For a lot of other people here, the anxiety of not knowing [the fate of their homes] is getting to them. Dr. Colleen Townsend, a family practice doctor in Napa, is helping to staff the makeshift medical center inside one of the buildings on the fairgrounds. She says anxiety is one of the main complaints. And that is making other health conditions worse.
>
> "So many folks in this area are really affected by chronic illness," Townsend says, especially diabetes and high blood pressure. Because people were evacuated so quickly, many didn't have time to grab medications.
>
> "Certainly in these settings their blood sugar and blood pressure are already rising just from the stress of the occasion," Townsend said. "Without adequate supplies of their medicines, that can cause acute symptoms like feeling shaky, nausea, sometimes dehydration."

People have also been worried about their pets. Some residents are being escorted back into evacuation zones to retrieve them. It's dangerous out there for animals, as can be seen in this post (https://www.facebook.com/Wasson-Memorial-Veterinary-Clinic-121404277937611/timeline/) by a veterinary clinic in Lakeport. The clinic is treating a burned black cat that was rescued by firefighters near Middletown.

(http://ww2.kqed.org/news/wp-content/uploads/sites/10/2015/09/cat.jpg)

It's disturbing, yes, but fear not, the cat is doing much better. "Eyes are improving fast!! He's purring and rubbing his head for kitty kisses!! Thanks for all the inquiries!!" the clinic wrote. If you know who the owner is, call 707-263-5380.

(http://ww2.kqed.org/news/wp-content/uploads/sites/10/2015/09/cat2.jpg)

Update 1:40 p.m., Tuesday, Sept. 15

In Napa County, near Pope Valley and Angwin, advisory evacuations have been lifted for Summit Lake Drive, Howell Mountain Road North, North White Cottage Road and Ink Grade Road.

Update 10:40 a.m., Tuesday, Sept. 15

In an emotional letter to his colleagues (http://www.pressdemocrat.com/news/4479072-181/valley-fire-lake-county-is) on Monday, Santa Rosa Press Democrat staff photographer Kent Porter captured the havoc caused by the fire:

> I am floored by the amount of devastation I've seen. Whole communities were wiped off the map in a matter of minutes. We all have friends up there, families and people we've met in passing. What struck me the most is the utter completeness of this disaster.
>
> Virtually nothing is left above the proper of Cobb. The houses are down to foundations, even some chimneys are gone. Driving through the area is like looking at a ghost community. So much gone, so many ways of life disrupted, so much hardship remains for the people affected. In Middletown, you can draw a line where firefighters stopped the fire. They saved downtown. Anderson Springs is nearly 80% wiped out, same goes for the homes along Highway 175 in the canyon to Cobb. Hidden Valley suffered losses too, as did Hobergs and Adams Springs. I didn't make it to Siegler Canyon, it was way too dangerous (but I did try).
>
> We're all journalists, we've all seen catastrophes and witnessed amazing, great things. If there is anything you can donate, especially for the children and seniors, now would be a good time. Overwhelmed is pretty good word to use when you think of what an uphill climb it will be for them.

Update 10 a.m., Tuesday, Sept. 15: In this morning's update from Cal Fire, the agency said more resources have been arriving to fight the Valley Fire. Firefighting aircraft are now in operation, and lower temperatures and higher humidity are aiding efforts.

The toll of homes destroyed now stands at 585, and hundreds of other structures have also been destroyed. Nine thousand other structures are still threatened.

The fire has now scorched 67,000 acres — about 100 square miles — and is 15 percent contained. The hope is containment can be increased before the weather shifts again. About 13,000 people have been evacuated from their homes.

Listen to KPFZ Community Radio Lakeport (http://www.live365.com/stations/steveelias)
(http://www.live365.com/stations/steveelias)

Areas surrounding the town of Cobb were hit hard yesterday, with about 100 homes burned. The Friends of Cobb Mountain Facebook page (https://www.facebook.com/friendsofcobbmountain) has been posting local reports of damage.

Here is the latest map of the Valley Fire from Cal Fire. You can see the small communities that have been swallowed up in red — places like Adams, Howard Springs, Whispering Pines, Hidden Valley Lake. Click on the map (https://www.google.com/maps/d/viewer?mid=zp8nK_5HoMFQ.kzTmU5XK-qJQ&hl=en) and you'll be able to zoom in.

(https://www.google.com/maps/d/viewer?mid=zp8nK_5HoMFQ.kzTmU5XK-qJQ&hl=en)

Evacuation orders in parts of Napa County have been made advisory instead of mandatory. From the Napa Valley Register (http://napavalleyregister.com/news/local/fire-evacuations-eased-in-napa-county/article_603dcf63-69c3-5cec-bff2-35c9285061ad.html):

The advisory evacuations cover Pope Valley Road between Aetna Springs Road and Howell Mountain Road, Ink Grade, Summit Lake Drive and North White Cottage.

Mandatory evacuations remain in effect in Napa County along Butts Canyon Road, Berryessa Estates, Snell Valley Road and Pope Valley Road from Aetna Springs North to Lake County.

Mandatory evacuation orders still remain in effect for:

Hwy 29 x Hwy 53, South on Hwy 29 to Tubbs Lane in Napa County, all of Hwy 175 in the Cobb area, Point Lakeview to Soda Bay on Hwy 281, all of Bottle Rock Road and High Valley Road. Butts Canyon Road from Hwy 29 to Napa County line (including all of Berryessa Estates). The communities of Twin Lakes, Hidden Valley Lake, Middletown, Aetna Springs, Seigler Canyon, Loch Lomond, and the Riviera Areas.

Fire officials said today some people are being allowed back into their homes to get pets and medication. A high school near Lower Lake is being used as a staging area to bring people to their homes, reports KQED's Scott Shafer. Residents will have 15 minutes to check, feed and water animals.

Monday night in the Kelseyville High School cafeteria, now being used as an evacuation center, hundreds of people lined up for a dinner prepared and donated by celebrity chef Guy Fieri, who owns property nearby. The feast was small consolation for evacuees like Lela Prather, who lives in Loch Lomond, another Lake County community now threatened.

"I haven't heard recently about our houses," she told Scott Shafer, her voice cracking with emotion. "We don't know if our houses are there right now. Because the wind has picked up and ... I don't know."

Many people were similarly emotional as they waited and wondered what they'll go home to — including the condition of pets, in some cases — when Cal Fire finally gives them the green light to return.

Despite the severe stress and loss of property caused by the fire, some Lake County residents saw a silver lining, in that it has brought the community together.

Walt Frazier Jr., vice president of the local Vietnam Veterans chapter, sheltered at Kelseyville High School last night. He said he was impressed by how people have united across cultural and economic barriers.

"We've had helicopters coming in, helping out, aircraft coming out," he said. "But what I'm seeing are the citizens, the residents, including the ones who've been displaced, helping out with one another, calming each other down emotionally. Because this is an emotional impact on the whole county."

Also yesterday: Barbara McWilliams was identified as the lone fire-related fatality. She told her caretaker she didn't want to leave her home near Middletown, despite the nearby blaze. Her body was found late Sunday in her burned-out home after flames kept Lake County sheriff's officials from reaching her.

Jennifer Hittson, McWilliams' caregiver, told the Santa Rosa Press Democrat that she left McWilliams' home around 3 p.m. Saturday, unaware of the fire's seriousness or how quickly it would grow, even though officers were at that point turning drivers away from Highway 175, which leads to the Cobb Mountain area where McWilliams lived.

Hittson said she called the sheriff's office twice Saturday and Cal Fire on Sunday, only to be told by dispatchers, "We will get out there when we can."

Hittson saiid McWilliams could walk slowly and that her hands were weak. "That I left her there, it haunts me," she said.

Update: 8:45 p.m., Monday, Sept. 14: According to the latest report from authorities stationed in Lakeport, the Valley Fire had grown to 62,000 acres as of Monday evening, 1,000 acres larger than its previous size, and was at 10 percent containment.

Meanwhile, a report (http://www.latimes.com/local/lanow/la-valley-fire-victim-20150914-story.html) in the Los Angeles Times identified the woman who was killed in the Valley Fire as 72-year old Barbara McWilliams, who suffered from multiple sclerosis. The report includes an account from McWilliams' caretaker, Jennifer Hittson, who said she'd phoned authorities more than once to alert them that McWilliams needed evacuation assistance.

Update: 4:35 p.m., Monday, Sept. 14: The Lake County Sheriff's Office has released more information about the first victim killed in the Valley Fire. First responders received a phone call at 7:12 p.m. on Sept. 12 to help an elderly, disabled woman evacuate a subdivision on Hot Springs Road. Officers and deputies arrived to the area at 7:29 p.m., but were unable to make it to her home before the structure was

engulfed in flames, according to a statement from the sheriff's office.

Update: 1:30 p.m., Monday, Sept. 14: The Valley Fire has damaged The Geysers, a network of 14 power plants run by Calpine and one of the largest geothermal complexes in the world. Calpine has confirmed that the blaze damaged five of its cooling towers.

(http://ww2.kqed.org/news/2015/09/14/photos-scenes-from-the-lake-county-valley-fire)

"The vast majority of the employees who would typically be working today were notified not to try to come to the site," spokesman Brett Kerr told KQED's Ted Goldberg.

The company sells electricity produced in the area to PG&E and other utilities. Calpine reduced its operations in response to the damage, impacting roughly a third of its energy output.

Meanwhile, at a medical tent set up at an evacuation center in Calistoga, Red Cross volunteers and staff from a nearby clinic were working to treat evacuees experiencing health problems. While smoke inhalation was a more immediate medical concern yesterday, evacuees are now grappling with symptoms associated with chronic health conditions, such as diabetes or high blood pressure.

Many residents who fled their homes left too quickly to take prescription medication along, volunteers working in the medical tent told KQED's April Dembosky. Evacuees suffering from diabetes are more vulnerable to health impacts because stress and anxiety can exacerbate the condition.

As of early Monday morning, the Valley Fire had scorched some 61,000 acres since Saturday and was only 5 percent contained. The Butte Fire, which has been burning for more than five days, was 30 percent contained with more than 71,000 acres scorched by flames. At a press conference held Monday morning, Gov. Jerry Brown pegged the total cost of California wildfires at $212.6 million (http://www.kqed.org/news/2015/09/14/gov-sees-dawn-serious-fire-situation-costs-top-212-million) through early last week, before factoring in the costs of this weekend's devastating blazes.

Update: 11:06 a.m., Monday, Sept. 14: A total of 23,000 people had been displaced by the Valley and Butte fires as of Monday morning, according to the Associated Press. That includes 13,000 who were forced to leave their homes due to the Valley Fire and another 10,000 from the Butte Fire.

Update: 10:10 a.m., Monday, Sept 14: The Valley Fire has devastated Harbin Hot Springs, a popular nonprofit retreat and workshop center established in 1972 that has long attracted Bay Area residents seeking holistic health therapies. Michael Hardy of Posterity Productions posted seven photographs on Facebook (https://www.facebook.com/PosterityProductions/photos/a.301054341222216.107358.281.1377822222827177/801055514222117/?type=3&theater) showing a number of structures reduced to rubble, including gathering spaces where guests would practice yoga and walkways that led to soaking pools.

An update posted to the retreat center's Facebook page Sunday at 10 p.m. indicated that staff and residents were staying with friends, or being temporarily housed at evacuation centers. "As soon as we know specifics about damages on the property, we will post news here and on the Harbin website," the message noted.

Meanwhile, about 800 people spent last night at the Red Cross evacuation center in Calistoga in campers, tents or just under tarps. Many of those who had to evacuate are still trying to get over the shock of leaving their homes as the flames encroached.

"We could see it on the mountain. It just came, it came with a vengeance, it came so fast," said Theresa DeGroot. "And then we knew. Winds came, it was strong winds, and we had to get out fast."

DeGroot says the only thing left of her Middletown home is the chimney.

Update: 8:15 a.m., Monday, Sept. 14: Cal Fire's morning update (http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=1226) says the fire continues to grow and has now scorched 61,000 acres. The blaze is 5 percent contained. Still no word on the one fatality reported — Cal Fire says only that it's being investigated by "law enforcement."

The Santa Rosa Press Democrat (http://www.pressdemocrat.com/news/4473834-181/valley-fire-one-reported-dead?gallery=4475505) puts the evacuation count at 20,000 people.

Update: 10:00 p.m., Sunday, Sept. 13: The Valley Fire is raging through parts of Lake and Napa counties. It has burned through 50,000 acres and destroyed 400 homes, two apartment complexes, 1,000 outbuildings and 10 businesses, by last count. It has also taken the life of at least one person, Cal Fire says, and injured at least four firefighters. Gov. Jerry Brown has declared a state of emergency (http://cert1.mail-west.com/Rylk2/7rmx/myuujmm/rnewa7ru2Rg/hhl/yvnqxRgh/ruR/vu01601/illfqvl_c=dV7Cz7pmzwmhbgt%7C3g06bouiuyvvhk_co=1441576%2.7994ccbgad7541b2262abe04d35797) in the two counties. About 17,000 people have been evacuated from their homes, KXTV-Sacramento is reporting (http://www.abc10.com/story/news/local/2015/09/13/valley-fire-update-state--emergency-declared-mandatory-evacuations--napa-county--40000-acre-blaze/72203574/), and containment is thus far zero percent.

Lake County Sheriff Brian Martin called the fire "the worst tragedy Lake County has ever seen," the Santa Rosa Press Democrat (http://www.pressdemocrat.com/news/4473834-181/valley-fire-hellish-blaze-grows?gallery=4475505) said.

At the Napa County Fairgrounds in Calistoga, one of two evacuation centers that have been established, officials estimated about 800 evacuees had been taken in tonight, sleeping in tents and trailers. Officials are warning those who have left their homes not to give their addresses online, as potential burglars are posing as members of the media who are offering to check on the status of abandoned residences.

Others are using the Internet to better ends: Here's a damage report (https://m.facebook.com/story.php?story_fbid=877913669584848&id=560613860732122), posted on the Friends of Cobb Mountain Facebook page, detailing the condition of various areas in Cobb — population under 2,000. "There are simply no words to express the terrible fullness of our loss," reads a post from Saturday. "Many of us in the community have lost our homes, pets, property, and so much more. But let's remember that a community is, at its heart, people. We will return, we will rebuild ..."

Click here for a map of the fire's perimeter (https://www.google.com/maps/@38.7831498,-122.7321946,11z/data=!4m2!6m1!1zp8nK_5H0MFQ.kxTmU5YK-qJQ?hl=en).

(https://www.google.com/maps/d/viewer?mid=zp8nK_5H0MFQ.kxTmU5YK-qJQ&hl=en)

News accounts have also captured the sudden devastation that has swept through victims' lives. "I'm standing in the middle of a bombed-out town," a Cal Fire battalion chief told the New York Times (http://www.nytimes.com/2015/09/14/us/northern-california-wildfires.html), speaking of 1,300-resident Middletown in Lake County, roughly 90 miles north of San Francisco. "I'm on a block of burned-down structures. There's the frame of a mobile home — that's all that's left. The cars are burned-out hulks. The trees look like skeletons. There's a porch swing, a bathtub. I'm seeing the remnants of somebody's life."

VALLEY FIRE INFORMATION (HTTP://CDFDATA.FIRE.CA.GOV/INCIDENTS/INCIDENTS_DETAILS_INFO?INCIDENT_ID=1226)

(http://goo.gl/maps/P2Z8i)

Get the latest details directly from Cal Fire.

- Cal Fire Web Site (http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=1226)
- @CalFireFire on Twitter (https://twitter.com/hashtag/valleyfire?src=hash&vertical=default)
- Downtown, school closures, shutdown (http://abcnews.com/news/evacuations-valley-fire-evacuation-centers-school-closures/6125178/) (ABC)
- Downtown motion (http://www.lakecounty.com/)

"My house burned down. Everything burned down," 33-year-old Justin Olson told the Napa Valley Register (http://napavalleyregister.com/news/local/wildfire-scorches-lake-county-towns-forces-evacuations-to-calistoga/article_c036c27b-2071-588c-a0d0-d73dc4a6e1a0.html). "All I have is just what I had on me. Didn't even have a car — I hitchhiked down here; someone stopped and I jumped into the back of his pickup truck. All you could see was this big wall of fire coming toward us ..."

Many have posted devastating photos using the #ValleyFire hashtag (https://twitter.com/hashtag/valleyfire?f=tweets&vertical=default)on Twitter.

The Valley Fire is one of the fastest-burning in decades. It took just 12 hours to burn through 40,000 acres, the L.A. Times (http://www.latimes.com/local/lanow/la-me-ln-california-wildfire-spread-with-mind-boggling-speed-20150913-story.html?utm_source=twitterfeed&utm_medium=twitter) reported.

"There aren't very many fires in California's history that have done that. I don't know if there really is a precedent for it," climate scientist Daniel Swain told the paper. "This fire sort of broke the rules even relative to this incredible season that's already occurred."

"It wasn't even a fire. It was like fluorescent evil," Whispering Pines resident Bill Gavin told the Press Democrat (http://www.pressdemocrat.com/news/4474770-181/valley-fire-evacuees-tell-of?gallery=4475505). "I saw sections like football fields go up in four seconds."

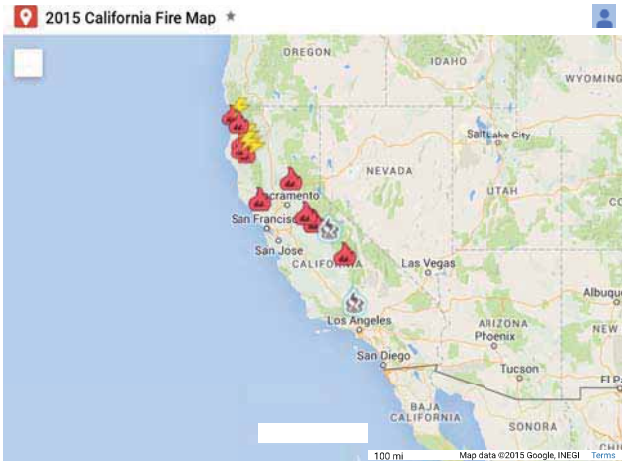
Here is a hair-raising video posted by someone who said he was fleeing Anderson Springs.

Escaping Anderson Springs during Valley Fire

Here's a Press Democrat video of the devastation in Middletown.

Valley fire: Burned homes on Jefferson Street, Middletown

Below is a map of all the active fires in California (https://www.google.com/maps/d/viewer?mid=zp8nK_5HoMFQ.kzTmU5XK-qJQ&hl=en&usp=sharing). The Butte Fire (https://www.google.com/maps/d/viewer?mid=zp8nK_5HoMFQ.kzTmU5XK-qJQ&hl=en&usp=sharing), burning in Amador & Calaveras Counties, is now at 65,300 acres, or about 102 square miles. That's slightly larger than the city of Sacramento. The fire is 25 percent contained. So far, 135 residences and 79 outbuildings have been destroyed, Cal Fire says.



Update: 5:30 p.m., Sunday, Sept. 13:
At a 5 p.m. briefing at the Napa Fairgrounds, Cal Fire officials said that most of the commercial business in Middletown and the high school remain intact, but many homes off the main drag have been impacted. Chris Childs of the Napa CHP said it will be at least two days before residents can return to their homes.

Update: 4:45 p.m., Sunday, Sept. 13:
State fire officials are reporting the Valley Fire has increased to 50,000 acres, with containment remaining at zero percent. The Associated Press has called the Valley Fire one of the "fastest-burning wildfires in decades."

Mandatory evacuations have been ordered (http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=1226) for the following locations:

> Point Lakeview Hwy and Hwy 281, Rivera West and Clearlake Rivera, Hwy 29 (Kelseyville) at Hwy 175 south on Hwy 175 towards Cobb, Red Hills Road to Hwy 29, Hwy 29 X Hwy 175 south to Seigler Canyon Road (south side of Hwy 29), Hwy 29 Tubbs Lane (Calistoga, Napa County) to Hwy 29/Hwy 53(Lower Lake, Lake County) Butts Canyon Road to Napa County Line, including Berreyssa Estates, Butts Canyon Road to Pope Valley. Communities of Cobb, Seigler Canyon, Loch Lomond, Middletown and Hidden Valley Lakes, Livermore Road, Summit Lake Road and north of the community of Angwin.

According to KQED reporter Danielle Venton at the Napa Fairgrounds in Calistoga, one of two current evacuation centers, evacuees have begun arriving and are numbering in the hundreds. However, the evacuee team anticipates closer to 1,000 at the fairgrounds by dinner time.

Venton says that, for the most part, spirits are up among evacuees and a sense of community is noticeable throughout. Some have started pickup football and soccer games, while others have picked up instruments and started jamming.

(http://ww2.kqed.org/news/wp-content/uploads/sites/10/2015/09/DSCF0132.jpg)

Tents for Valley Fire evacuees being set up at the Napa County

Fairgrounds. (Danielle Venton, KQED)

(http://www.kqed.org/news/wp-content/uploads/sites/13/2015/09/DSC0111.jpg)

Sydney, age 8, rescued her favorite stuffed animal, Firehart, and her bear and arrow. She's posed with her neighbors chickens and her friend, Zack. (Danielle Venton, KQED)

Update: 12:15 p.m., Sunday, Sept. 13:

State fire and Lake County officials are surveying what's believed to be a massive amount of destruction caused by the Valley Fire that's prompted some 15,000 residents to flee their homes and sent smoke into nearby communities.

"I think it's going to be pretty devastating," said Jill Ruzicka, spokeswoman for the Lake County Office of Emergency Services. "All of us know people who have lost their homes."

The Valley Fire is the third large wildfire to burn in Lake County in the last few months. Ruzicka said it is already, by far, the most destructive to people's livelihoods.

"It's difficult for us to come to full staff right now because so many of our people are either under evacuation notices or have lost their homes," Ruzicka said.

Cal Fire has yet to publish any official data on the number of structures damaged or destroyed by the blaze, but reports are coming in and it looks bad.

"I have seen some destruction in and around the Middletown area," said Amy Head, a spokeswoman for Cal Fire.

"There are parts that I couldn't even make into myself," Head said from Hidden Valley, another community under evacuation orders.

Residents who fled from Middletown told the Associated Press the cars they were driving dodged smoldering telephone poles and billowing smoke as they left.

The blaze is believed to have started on Cobb Mountain, an area that normally gets lots of rain. The drought has obviously changed that.

"For a fire to spread from there all the way to where it is now is very unprecedented," Head said. The lack of rain, Saturday's strong winds, and the area's low humidity and hot temperatures were all factors that helped the fire spread so quickly.

More than 1,000 firefighters are battling the blaze. Cal Fire says getting more of them to the scene is difficult.

"We're having to place orders for additional resources," Head said. "We are spread pretty thin throughout Northern California with the other fires, so we're having to pull resources from wherever we can."

The fire has sent ash and smoke miles away. "It almost looks like Bay Area fog, we are so socked in with this smoke," Ruzicka said from Lakeport, about 25 miles northwest of Middletown. "This morning when I woke up, my car was covered in ash."

The Red Cross has set up two shelters: one at Kelseyville High School at 5480 Main St. in Kelseyville and another at the Napa County Fairgrounds at 1435 N. Oak St. in Calistoga. According to the Red Cross, a community meeting is planned at the Kelseyville site at 2 p.m. and at the Calistoga one at 5 p.m.

Update: 8:40 a.m.: From the Associated Press

Gov. Jerry Brown has declared a state of emergency in Lake and Napa counties after a wildfire charred more than 60 square miles within 12 hours, prompting thousands to flee (http://www.pressdemocrat.com/news/4470452-181/thousands-under-order-to-flee?page=2#gallery=4470892) their homes.

Brown said Sunday the declaration will expedite debris removal and waive fees to people who need to replace official documents lost in the fire.

The blaze, about 100 miles north of San Francisco, has destroyed an unconfirmed number of homes and other buildings and damaged highways and other infrastructure.

Brown had earlier declared a state of emergency for a separate 101-square-mile wildfire about 70 miles southeast of Sacramento that has destroyed 86 homes.

frostjeff • 3 days ago Follow

Last night was the most insane night of my life. I watched an entire town burn to the ground. My sympathy goes to the residents of #Middletown #california. This is not going to be an isolated incident. We have to all get together and stop putting carbon into the atmosphere. It's time to take responsibility and acknowledge that it's a bad thing to do. I'm exhausted and heartbroken and overwhelmed, but it's absolutely nothing in comparison to the hundreds of people who just lost their homes. #ValleyFire #cadrought #wildfire

748 likes 108 comments

Original Post: Bay City News Service

The Valley Fire (http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=1226) that started in Lake County (http://www.co.lake.ca.us/) Saturday has now burned an estimated 40,000 acres and is zero percent contained as of this morning, according to Cal Fire officials.

Additional mandatory evacuations have been ordered in Lake County from state Highway 29 and state Highway 175 to Seigler Canyon Road, and for state Highway 29 at state Highway 175 toward Cobb, and Red Hills Road to state Highway 29.

More than 1,000 firefighters are fighting the fire and getting people evacuated from the area.

Areas of Napa County are under advisory and could be under mandatory evacuations later today.

The fire injured four firefighters who were part of a helicopter crew Saturday. The firefighters suffered burn injuries and were transported to an area burn center.

Cal Fire is reporting there have been an unconfirmed number of structures destroyed in the fire.

There are currently more than 5,000 residents without power.

David Weir, Don Clyde, Ted Goldberg, Alex Emslie, Danielle Venton and Sheri Quinn contributed to this report.

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EXPLORE: ENVIRONMENT (HTTP://WW2.KQED.ORG/NEWS/CATEGORY/ENVIRONMENT), SCIENCE (HTTP://WW2.KQED.ORG/NEWS/CATEGORY/SCIENCE), FIRE (HTTP://WW2.KQED.ORG/NEWS/TAG/FIRE), LAKE COUNTY (HTTP://WW2.KQED.ORG/NEWS/TAG/LAKE-COUNTY), NAPA COUNTY (HTTP://WW2.KQED.ORG/NEWS/TAG/NAPA-COUNTY), VALLEY FIRE (HTTP://WW2.KQED.ORG/NEWS/TAG/VALLEY-FIRE), WILDFIRE (HTTP://WW2.KQED.ORG/NEWS/TAG/WILDFIRE)

(http://ww2.kqed.org/news/2015/09/13/valley-fire-forcing-residents-to-evacuate-injures-firefighters-in-lake-county?share=facebook&nb=1)

(http://ww2.kqed.org/news/2015/09/13/valley-fire-forcing-residents-to-evacuate-injures-firefighters-in-lake-county?share=twitter&nb=1)

(http://ww2.kqed.org/news/2015/09/13/valley-fire-forcing-residents-to-evacuate-injures-firefighters-in-lake-county?share=pinterest&nb=1)

Attachment 20

SFGATE http://www.sfgate.com/bayarea/article/Incredibly-fast-Valley-Fire-grows-quickly-6501998.php

'Incredibly fast' Valley Fire destroys hundreds of homes

By Evan Sernoffsky, Kale Williams and Kurtis Alexander Updated 10:38 pm, Sunday, September 13, 2015

IMAGE 1 OF 92

Orval Young faces what remains of his property amid the fierce flames that wrought destruction on Middletown (Lake County), where he has lived since 1972.

BUY THIS PHOTO

Valley Fire Explodes To 10,000 Acres, Prompting Mandatory Evacuations
CBS San Francisco
SF Bay Area

MIDDLETOWN, Lake County — Hundreds of homes were destroyed, thousands of people were forced to flee, and a state of emergency was declared in Napa and Lake counties as the rapidly spreading Valley Fire grew to 50,000 acres Sunday and tore through several communities, incinerating structures, fire officials said.

California Department of Forestry and Fire Protection spokesman Daniel Berlant tweeted late Sunday that there was a report of a fatality in the Valley Fire but that officials were still trying to confirm it.

About 140 miles away, another huge blaze, the 65,000-acre Butte Fire, torched 81 homes and 51 other buildings by Sunday in Amador and Calaveras counties, where it has been burning since Wednesday. In all, more than a dozen wildfires scorched drought-stricken and dry California on Sunday.

In Middletown, a handful of houses stood relatively unscathed in one neighborhood Sunday, but around them, where 24 hours before dozens of homes had stood, all that was left were concrete foundations and the empty metal shells of scorched home appliances, all covered with a fine white ash.

The quick-thinking efforts of firefighters probably saved the homes that still stood across from Middletown High School, as fire hydrants went dry around midnight Saturday and crews filled their tanker trucks from the school's swimming pool.

Spreading furiously

The rate at which the fire spread, jumping from 400 acres around 1:30 p.m. Saturday to 50,000 acres on Sunday, was astonishing, said Cal Fire spokeswoman Veronica Barclay.

"It's moving incredibly fast," she said. "It's very dry due to the ongoing drought, and there is just a lot of fuel up here."

The blaze came upon Ron Clark, 48, and his mother, Carol, 70, so quickly that they were forced to flee their home

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The Latest on California wildfires

on Gifford Springs Road in the community of Cobb with their two dogs, Marley and Sly, as 50-foot flames consumed large pine trees on either side of the road.

"The pines were exploding. The flames were close to the highway, and they were huge," Ron Clark said. "It was unbelievable. I've never seen anything like it. By then, it was get out or get burned. If we hadn't left when we did, this story wouldn't be told."

The Clarks initially ended up at the Twin Pines Casino in Middletown but were forced to leave as the fire grew closer. They would be directed from shelter to shelter throughout the night until they ended up at the Napa County Fairgrounds in Calistoga, where hundreds of evacuees spent the night in tents and recreational vehicles and on cots.

It was there, after running into neighbors, that the Clarks learned that their entire neighborhood, including their home, had been leveled.

As the fire swept through the village of Cobb, some residents fled onto a golf course — the only open area in town removed from the trees, dry grass and underbrush feeding the flames. Firefighters managed to save a small strip shopping center and a handful of adjacent businesses that make up most of Cobb's commercial district, as well as Cobb Mountain Elementary School.

Hoberg's Resort and Spa, a 55-acre collection of cabins and outbuildings, was destroyed. Most of the resort had been closed for remodeling, but a poster on a community bulletin board in town advertised a free history talk and walking tour on Sept. 20 "to reacquaint the community with recent changes at the property." Founded in the 1890s, it has been run by four generations of the Hoberg family.

On Sunday afternoon, Larry Menzio, owner of Menzio Tire on Barnes Street in Middletown, sifted through the rubble that was left of his business — little more than about 20 burned-out cars and a piece of twisted metal that used to be a vehicle lift.

Seemingly safe distance

Menzio said he saw the flames coming from Cobb, about 10 miles away, on Saturday but thought, "No way in hell it's going to get here. And then, all of a sudden, it just came in."

Rather than try to save his business, Menzio ran to try to protect the houses of his son and nephew, both in Middletown. They put water on the roofs and around the perimeters, and his son's house was spared, though his nephew's was lost.

As for his business, Menzio was at a loss. "I don't know what I'm going to do," he said. "I might call it quits."

Barclay said a damage assessment for Middletown and surrounding areas was just beginning Sunday morning, but that it did not look good for the community of roughly 1,300.

"We're just starting to get our people in there, but there's been quite a bit of damage," she said.

Berlant said that structure damage "still remains at an estimated several hundred homes and hundreds of other structures destroyed."

Video: Huge Wildfire Burning Out Of Control In Lake, Napa Counties

Many communities

The fire has forced evacuations of several thousand people in the communities of Cobb, Middletown, Loch Lomond, Hidden Valley Lake, the Harbin Hot Springs resort and areas around High Valley Road, Bottle Rock Road and Big Canyon Road.

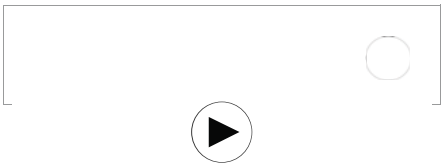
Evacuations were expanded to include Butts Canyon Road to the Napa County line, including Berryessa Estates and Highway 29 from north of Calistoga to Highways 29 and 53 in Lower Lake, as well as the communities of Clearlake Riviera, Riviera West and Point Lakeview to Soda Bay on Highway 281.

Evacuation centers were open at Kelseyville Presbyterian Church and the Napa County Fairgrounds in Calistoga.

On Saturday, four firefighters suffered second-degree burns battling the blaze. Members of Copter 104, a helicopter crew based in Lake County, were taken to UC Davis Medical Center, and all were in stable condition.

At least 1,000 firefighters were battling the blaze, with the help of four air tankers, and the governor's disaster declaration set the stage for an influx of California National Guard troops to supplement Cal Fire personnel.

Wildfire weather



The drought, a statewide heat wave last week and strong winds all came together to create the perfect environment for wildfires to spread rapidly, Berlant said.

"The drought conditions have led to increased fire activity all summer long," Berlant said. "But with triple-digit temperatures up and down the state last week, it caused the grass, brush and trees to be

tinder-dry. Then, as we saw temperatures begin to cool down, we saw winds increase, and it’s those winds that continue to fan many of these fires.”

The Valley Fire was just the latest in a series of devastating fires that have rocked Lake County and surrounding areas this summer. The Rocky Fire burned more than 69,000 acres in Lake, Yolo and Colusa counties before being fully contained in mid-August, and the Jerusalem Fire scorched roughly 25,000 acres in Lake and Napa counties before it was fully contained in late August.

The cause of the Valley Fire is under investigation.

Evan Sernoffsky, Kale Williams and Kurtis Alexander are San Francisco Chronicle staff writers. E-mail: esernoffsky@sfchronicle.com, kwilliams@sfchronicle.com, kalexander@sfchronicle.com Twitter: @EvanSernoffsky, @sfkale, @kurtisalexander

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Attachment 21

Napa Valley Register.com

LIFE ON THE EDGE

Angwin residents say they dodged a fire disaster

18 HOURS AGO • CHLOE F. JOHNSON
CJOHNSON@NAPANEWS.COM

As the Valley Fire lit up the Angwin sky over the weekend, some residents of Napa County's small mountain community were hit with mandatory evacuations while virtually everyone prepared for the worst.

Evacuations were briefly ordered for the eastern part of Angwin and made advisory in others until Tuesday. As the fire crossed out of Lake County into the northeast tip of Napa County and smoke blocked out the sun, residents grabbed pets and family keepsakes and fled to safer areas.

"If the fire had gone two miles, it would be in Angwin in a matter of minutes," said resident Duane Cronk, who has lived in the small, unincorporated town with his wife, Mary, for 52 years. The Cronks evacuated to stay with friends in St. Helena on Saturday.

Lori Dunn and her husband Randy were getting ready to crush the grapes from their Angwin vineyard when sheriff's deputies ordered them to evacuate. While Lori Dunn went to spend the night with family in St. Helena, Randy Dunn insisted on staying.

"I left. Randy stayed," Lori Dunn said. "He told the policeman he wouldn't leave. We have a fire truck and he bulldozed around the area and cut down trees. He felt quite confident that we were safe."

With Angwin only having one major road, traffic congestion could have made it hard to get out if the town of 3,000 had been subject to a mass evacuation, according to resident Donna Morgan.

"Howell Mountain Road is almost the only road out of Angwin," Morgan said Tuesday. "If it was ever blocked with people evacuating, it could be really difficult to get out. I'm feeling very relieved today. All I can say is, 'God bless our firefighters.'"

Angwin's all-volunteer fire department went into high gear to be ready to fight off the blaze, with help from Napa County firefighters.

"When the fire broke out, we staffed up the station and opened our own information center," said Capt. J.R. Rogers in a press release. The station was staffed for more than 36 hours until it was determined that the fire wasn't likely heading this way any longer.

Angwin's public elementary school closed Monday and Tuesday to protect its 78 students.

"I feel really fortunate that the school was spared," said school Superintendent Cheryl Lynn de

Werff. "We don't have buses, so we couldn't move out kids fast. As the superintendent, I have to keep the kids safe."

Napa County fire chief Barry Biermann said that drought conditions have made the wildfire problem worse than usual in California this year, and the fire risk will not go down as long as the drought persists.

"Until we get significant rainfall, the fire threat will not diminish," Biermann said. "I don't know when we're going to get out of this fire season."

Biermann urged Napa County residents not to use yard equipment with metal blades, especially on hot days, not to drive their cars off of roads, and to be very careful with campfires, cigarettes, and other small fires.

Attachment 22

WATERSHED SYSTEMS

NAPA VALLEY HILLSIDE VINEYARDS

CUMULATIVE EFFECTS OF CONVERSION OF UPLAND WOODLANDS AND CHAPARRAL TO VINEYARDS

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DECEMBER 24, 2000

EVALUATION OF CURRENT NAPA COUNTY REGULATIONS

CUMULATIVE EFFECTS OF UPLAND VINEYARD CONVERSIONS

PROBLEM STATEMENT

Misapplication of fundamental principles of soil science and hydrology has lead to a dangerous loss of upland infiltration capacity in the upland areas of Napa Valley that were formerly oak woodlands, chaparral and mixed conifer woodlands. Continued approval of conversions of native vegetation and undisturbed natural soil units to vineyards will likely lead to increases in downstream flood hazards and sediment yields. The sediments that accumulate in channels of the Napa River and its primary tributaries are not all derived from vineyards themselves, but also from channel erosion associated with increased runoff associated with hillside development. I have been asked to evaluate Erosion Control Plans for conversion to vineyards that have already been approved by the Napa County Planning Department pursuant to the Napa County Hillside Ordinance. These are also known as Conservation Regulations at Napa County Code Chapter 18, Section 108.

The approach of the Napa County ordinances is fundamentally incorrect and cannot protect either public health and safety or long-term land productivity. The existing ordinances seem to assume that by attempting to capture sediments from upland vineyard conversion areas; downstream cumulative effects are reduced to insignificance. This is not correct. Increased upland sediment yields, while important, are less hazardous to Napa Valley than are the changes in runoff timing, volumes, and rates. Increased runoff does have cumulative downstream effects through changes in rates of runoff and frequency of runoff events of a given magnitude. These changes are likely to be a significant factor in changing sediment loads in the main Napa River through changes in stability of side its tributaries.

The application of erosion control principles as a potential mitigation for all downstream cumulative effects of runoff change is misguided. Effects of vineyard conversion on hillside sediment yield and water runoff are largely independent of each other. It is probable that well-intentioned evaluation of the effects of potential hillside vineyard conversions without testing and monitoring of actual practices will result in incorrect hypotheses about how conversion of natural lands to tilled vineyards will behave. There can be no land management without land monitoring. The underlying principles that seem to guide the current Napa County Ordinance are not applicable and appropriate for evaluating the actual hydrologic effects of upland conversion to vineyards in the Napa area on slopes or hilltops.

Critical to proper cumulative effects evaluation is an understanding of the infiltration capacity of a site before and after vineyard conversion. Use of generalized regional soil characteristics to predict effects of conversion is shown to yield an incorrect model of the actual changes that occur during the preparation and planting of vineyards. Models of soil response that are derived from observations by the US Department of Agriculture for agricultural lands do not accommodate either the actual soil characteristics of Napa area uplands or the deep tilling and local stone removal that accompanies modern vineyard planting or replanting These models derived from the Modified Universal Soil Loss Equation (MUSLE) are what the consultants for the conversion plans used as the bases of their analyses.

Routine application of the MUSLE without accommodation of the unique Napa Valley soil characteristics that give rise to the inherent extremely valuable substrate for wine grape production, leads to errors that are now being multiplied throughout the Napa appellations. For example, the simple error that assumes, based on agricultural soil loss principles, that the steeper the slope, the greater the risk of soil losses and increased runoff, is fundamentally false for the eastern side of the Napa Valley uplands and for parts of the western side. In fact, slopes less than 30 percent have higher sediment and water yields than do those of greater than 30 percent, simply because the less steep slopes retain the clay-rich volcanic soils that are simultaneously more valuable for premium grape production and are more susceptible to decreased infiltration capacity when disturbed and are therefore more hazardous for conversion.

FIELD INVESTIGATIONS

During 1999 three vineyard conversion sites were visited for close inspection of field hydrologic and erosion control conditions. These sites were those for which erosion control plans had been developed and approved by Napa County. Added erosion control plans submitted and approved in the spring and summer of 2000 were reviewed and those sites were reviewed on aerial photos and overflights. Two overflights of the whole of the Napa Valley new vineyard conversion areas were made specifically to evaluate the magnitude of the conversion efforts and the characteristics of the sites being converted, to establish the representativeness of the sites and conditions of more detailed on-the-ground investigations.

Field investigations of hillside vineyard conversions were made on December 29, 1999 at Pahlmeyer Vineyards west-sloping and ridgetop development sites that were cleared and prepared for planting in 1999. This site is tributary to Milliken Reservoir and upper Milliken Creek, and was considered as representative of east-side headwater vineyard conversion conditions in oak woodland and mixed chaparral on Sonoma Volcanic series soils. Based on subsequent overflights (of early 2000 and 8/10/00), this site is believed to be representative of soil-hydrologic conditions on over 50% of the new Napa Valley upland vineyard sites. Chateau Potelle in the Mt. Veeder area on the west side was also inspected at sites already converted, at sites to be converted, and at sites of prior vineyards in the process of redevelopment. The Ch. Potelle conditions of mixed oak-madrone and conifer woodlands on rhyolite tuff parent materials may represent about 30 percent of the conversion sites of the last 5 years. Vineyard Properties West on and near the Hopper Creek headwaters were field inspected as a site that represents a mixed Franciscan metamorphic and volcanic parent material site in the west central fault zone portion of Napa Valley that had gone undeveloped for vineyards because of long-recognized poor quality grape production conditions but is now being developed in small parcels on steeper lands by persons for whom grape quality may be less important than appellation. This substrate characteristic includes landslides, erodable soils, and mixed hardwood and conifer native vegetation, and probably represents less than 15% of new vineyard development sites. Other new vineyard development in the southern part of Napa Valley and the Cameros area in oak grassland lower-gradient sites represent 10 percent or less of new hillside vineyards. These southern sites were reviewed from the air and through their erosion control plans and published soil maps but not with on-site soil investigations. The general findings and conclusions of this present report do not include opinions about low-gradient southern Napa County oak-grassland sites.

Additional field investigations were conducted in 1999 along the Napa River and its tributaries to inspect channel conditions, status of erosion and deposition, bank stability, present and past gauging sites, and stream substrate conditions. These investigations extended from the Napa/Lake County Line (Montesol Ranch) to the City of Napa and included observation of soil characteristics, evidence of gullying or silling that would indicate need for erosion control on uplands, and evidences for increases

in runoff in minor ephemeral channels. Soil drainage characteristics in Napa Valley floor alluvial soils were not inspected for this study effort but this author is familiar with them based on past work for established vineyards.

FINDINGS OF FIELD INVESTIGATIONS

Basic findings of field work were clear and rather straightforward. Vineyard development on uplands where natural vegetation is removed and where Napa County Erosion Control ordinance conditions are followed and approved by the County markedly decrease the capacity of the soil and the watersheds to absorb and retain rainfall. This is precisely the opposite of the predictions of the Napa NRCS/RCD upon which the Erosion Control Ordinance was justified[1].

Field investigations in December, 1999, showed that undisturbed soils under native vegetation, even where fire-maintained, had very much greater porosity and infiltration capacity than did the same sites after conversion to vineyards. Vineyard conversion does not emulate agricultural field conditions for which soil management models are developed. In all sites inspected in the Napa region, it was found that the deep raking and tilling of modern mechanized vineyard preparation brought high-clay-content subsoils to the surface, stripped off the protective and beneficial near-surface stone layers, and destroyed the one-to-three foot porous and permeable surface soil structure.

Napa County soil mapping was conducted from 1965 through 1973 and represents conditions as they existed in 1974[2]. The upland areas were at that time classed as rangelands and used for range, wildlife and recreation. The mapping scale and accuracy was appropriate for that land use, but not for later conversion to vineyards or other uses. In general, stone content was not originally delimited in the upland mapping units. For the Pahlmeyer site, the old maps show the Forward gravelly-loam as the primary soil unit which is defined as loamy soils developed on volcanic rocks (see Appendix A - Soil Descriptions).

Stone content is critical to soil hydrology. The loam and especially the clay-loam sites have soils that contract in the summer as they dry out. The stones in the soil profile do not contract, so a void space is left around each rock. Grass roots and percolating water need those spaces to move into when it starts to rain in the fall. As the soils become saturated they expand but the previous season's grass and shrub roots continue to provide avenues for infiltration of rainfall. Thus, the infiltration capacity of rocky expansive clay-rich soils is much greater than that of a simple clay-rich soil. Where stones remain throughout the soil profile, rainfall is carried down through the soil into cracks in the bedrock and it recharges the groundwater.. Where stones are absent on sloping clay-rich soils, rainfall runs off over the soil surface and removes the soil over geologic time. Where stones are removed, slopes will rill and gullies will form to remove that soil and expose bedrock to direct infiltration. It is a very simply balance and all natural slopes in Napa County are adjusted to the steepness and infiltration capacity necessary to accommodate the natural rainfall that has occurred historically. You cannot change the slope hydrologic characteristics without simultaneously changing the rainfall. Such change is not possible.

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[1] A theoretical modeling study was conducted by the USDS-NRCS Napa Field Office and the County RCD in 1998-99, comparing east and west side development based on agricultural soil management concepts and models: Haas, Julie, January 2000, *Napa River Watershed Hillside Development Runoff and Erosion Study*, Napa RCD.

[2] Lambert, G, J. Kashiwagi, B. Hansen, P. Gale and A. Endo, 1978, Soil Survey of Napa County: USDA Soil Conservation Service and UC Ag. Experiment Station. Published on-line at http://www.ca.nrcs.usda.gov/mlra/NapaSS/main.html.

By comparing the development of rills on newly exposed vineyards, the yield of sediment to the small catchments required under the Ordinance, and the runoff volumes associated with fall, 1999, small storms as evidenced by overflow of the sediment catchment basins, we were able to estimate the downstream offsite effects of conversion of hillside sites to vineyards. Although some allowance must be made for the "maturing" of new vineyards through time and the reestablishment of vertical permeability through no-till management of cover erosion-control crops, the real long-term damage is done through the deep tilling. The hourly precipitation record from Atlas Peak was used for this field analysis.

Hundreds of thousands of years of slow downward movement of clay particles derived from volcanic ash inputs to all the Napa Valley hillside soils, as well as from the varied parent soil materials, is undone in a few days of modern site preparation for vineyards. Those segregated clays are brought again to the surface and mixed in the soil column, creating a substrate for planting that is only able to absorb 10 to 50 percent of the normal and usual seasonal rainfall peak events. To add insult to injury, the larger stones and small boulders that have, over hundreds of millennia, accumulated as a lag deposit near the surface through several geologic processes, including ground freezing during 10's of thousands of years of much colder weather in past geologic time, and that now serve to create seasonal voids and surface protection, are often deliberately removed from the soil in the mistaken belief that they may impair fertility or management options for vineyards. In clay-rich parts of southern France these stones are deliberately worked into the soil to prepare new sustainable vineyards, while here we deliberately reduce tilth and soil moisture holding capacity and increase soil erodibility by removing them.

By comparing the observed reductions in soil moisture holding capacity and capacity to allow water infiltration with the actual historical record of precipitation in and around the Napa Valley, it is a straightforward and simple exercise to determine how hillside vineyard conversion will affect runoff. Determining how that increased runoff will erode and transport soil is somewhat more complicated and is the focus of erosion control plans, but by observing and monitoring the existing Napa County upland conversion sites, theoretical erosion models can be calibrated and the volumes of sediment to be derived from the vineyards themselves can be determined. Monitoring is not difficult. Maintaining and removing sediment from the small sediment basins required under the County Ordinance is a necessary part of vineyard management. It is but one more step to calculate the volume of that sediment and not too much more difficult to determine the overflow of runoff from those basins to calculate increased water yield. Again, one cannot manage without monitoring.

The increased runoff volumes themselves can be expected to erode banks and beds of tributary channels and to entrain in-channel sediment that will then be deposited in the lower-gradient reaches of those tributaries or in the main-stem of the Napa River. This we see happening in some sites, such as lower Hopper Creek below and within Vineyard Properties West. Construction of reservoirs may have counteracted or slowed this cumulative downstream offsite effect, but if and when those sediment traps fill, we will again see a reversal of channel stability. Below new on-channel tributary reservoirs today, we see channel erosion and net downstream cumulative hydrologic effects. Reservoirs trap coarse sediment that is needed by the tributaries to maintain their erosional energy balance. By trapping coarse sediment, we increase bank and bed erosion downstream. Fine sediments carried from tributaries below vineyard conversion sites may be ultimately sluiced through the Napa River to be deposited in the tidal marsh. But those sediments reduce spawning gravel function and rearing habitat as they pass to San Francisco Bay. And once they get into the tidal marshlands, they decrease the ability of those sites to transport water and sediment and thus increase backwater effects in the lower River, possibly increasing flooding in Napa. While we cannot pick up a handful of sand and silt from the Napa River bed today and establish where it came from, we can note that today's steelhead populations are but 20% of those of the 1950's and 1960's and that such declines can be explained by observed reduction in spawning and rearing habitats.

NAPA SOIL CHARACTERISTCS - EAST VS WEST SIDE

Eastside upland soils derived from both volcanic parent materials and from more recent additions of volcanic ash were found to be those with the greatest changes accompanying conversion to vineyards. Our field investigations showed that soils under chaparral or mixed oak and chaparral were able to absorb on the order of 12 inches of intense short-period precipitation without generating overland flow. Stony subsoils can allow percolation of that accumulated 12 inches of precipitation in a week or less so that natural upland areas can accommodate even the extreme precipitation events recorded in the Napa area, including several 12-inch rainy periods in a single season. This determination is based on surface and subsurface soil characteristics in the sites of native vegetation, and on the evidences or lack thereof for rill, gully, and sheetwash erosion. Soil types were mapped on the old maps as Forward gravelly loam and Bressa-Dibble complex.

This means that surface runoff is minimized under natural soil and vegetation conditions and that the geomorphic development of a drainage network does not need to accommodate frequent surface runoff by developing a denser headwater tributary network. Because broad areas are able to absorb all the precipitation that falls in almost all years, groundwater is recharged readily into fractured permeable volcanic rocks, water tables are not perched, and springs and seeps will flow in lower canyons through dry periods as well as wet. The primary upland drainage network is probably developed after major fire followed by El Niño type winters when temporarily hydrophobic soils reduce infiltration and increase the ratio of runoff to rainfall.

A particular characteristic of many eastside soils is that the *less* steep the slope, the higher the clay content, and the greater the post-conversion erosion hazard under contemporary conversion techniques. Slopes over 30 to 40 percent have largely been stripped of their residual clay-rich soils, or they may never have developed there. Such sites are characterized by exposed surface bedrock and residual stones with moderately high infiltration capacity and little soil moisture holding capacity. The Napa County Erosion Control Ordinance requires assessment and mitigation on sites that are less erodable while ignoring those that are more erodable. This reversal of standard theory is not seen on the west-side watersheds.

Eastside soils with higher silt-clay subsoils were observed to loose 60 to 70 percent of their capacity to absorb regularly occurring intense rainfall after initial conversion to vineyard. What this means practically is that an east-side site that could absorb the maximum-intensity cumulative 1-week rainfall that might occur only once every hundred years or longer, will now become saturated and generate runoff every average year. This means, roughly, that surface erosion may occur 100 times more frequently.

As the following figure (1) illustrates, there is a 10 percent chance that a rainfall of 1-inch will fall in any given day in late January of any year along the east side of Napa Valley. There is almost a 5% chance that a 2-inch daily rainfall will fall in any given winter day, but there is virtually no chance (less than 1 percent) that an 8-inch daily rainfall will occur. The natural shape of hillsides in Napa Valley and the drainage networks that develop naturally to drain them, are delicately adjusted to the natural characteristics of rainfall and runoff that occur under native vegetation on native soils. When these are changed, the slope equilibrium, or fluvial geomorphology of the hillsides must change to respond to the new conditions. We found that natural slopes of less than 30 percent gradient could accommodate an initial 6 to 8 inches of daily rainfall without surface saturation and runoff while those converted to

vineyard immediately adjacent on the Pahlmeyer site generated runoff, silting, and completely filled and overflowed the County-required detention ponds with the first 1 to 2 inches of fall rainfall in 1999[1].

Looked at another way, Figure 2 shows the extreme values recorded historically through the year and the average daily values for two Napa Valley long-term climate stations. Daily precipitation that exceeds 6 inches (the minimal capacity of natural ridge-top soils) is very rare, but those that exceed One and one-half to 2 inches (the capacity of the converted lands) are very common. At both Calistoga and Angwin there have been an average of 13 days per year with precipitation greater than 1 inch in the 52-years of records since 1948. At Calistoga there was one day only (2/17/86) with precipitation greater than 6 inches (8.10 inches) for 52 years of record. Thus we can expect that the converted lands will yield runoff that exceeds the preconversion values by a substantial amount about 13 times a year, and that this excess will exceed runoff from unconverted natural lands at least 1200 days per century [one event in 52 years on natural lands versus 13 events per year on converted lands]. This is even more than a hundred-fold increase. All statistics are taken from Western Regional Climate Center sources at http://www.wrcc.dri.edu/cgi-bin/

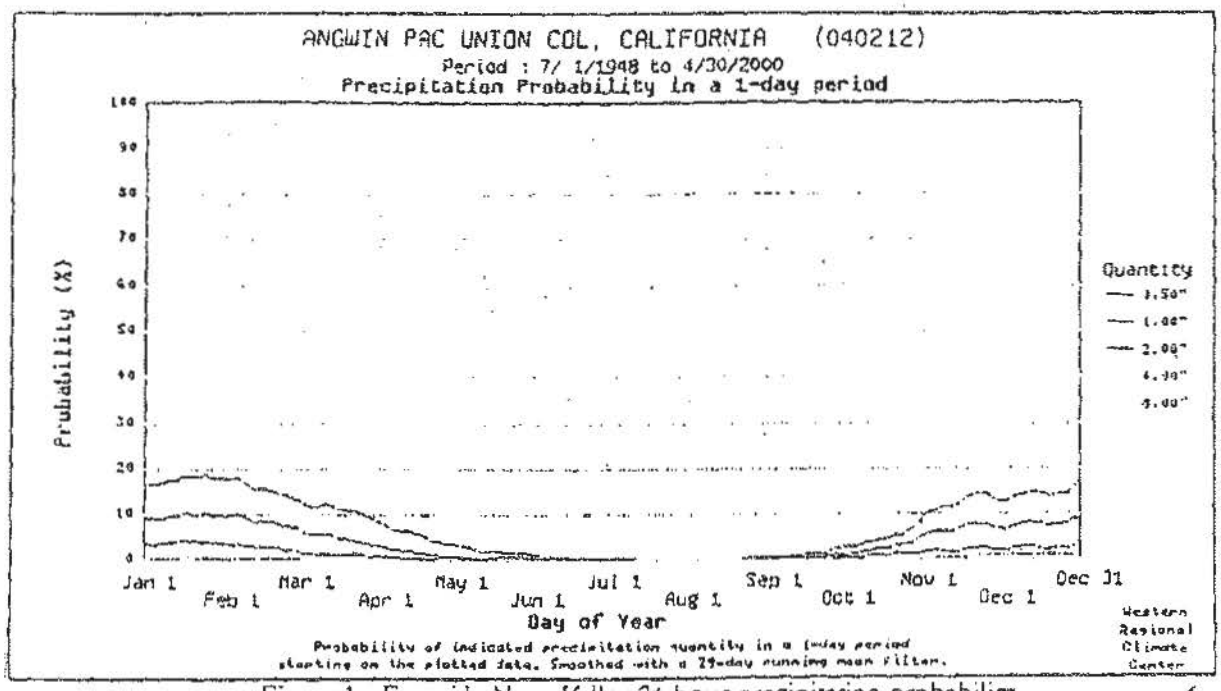
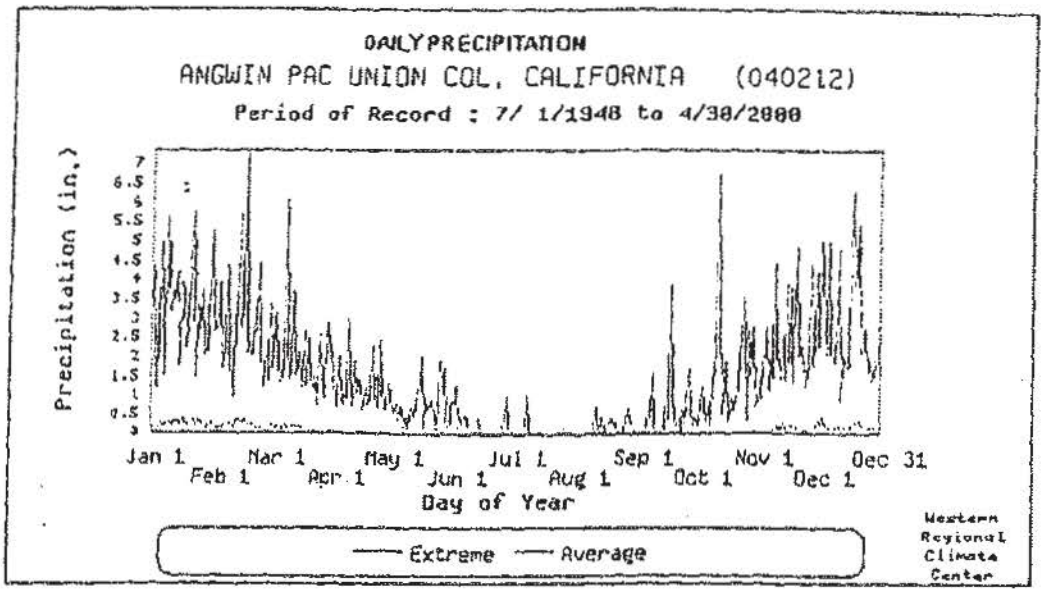


Figure 1 - East-side Napa Valley 24-hour precipitation probability

[1] Based on Atlas Peak hourly precipitation record. Pahlmeyer's on-site record was not available to us.



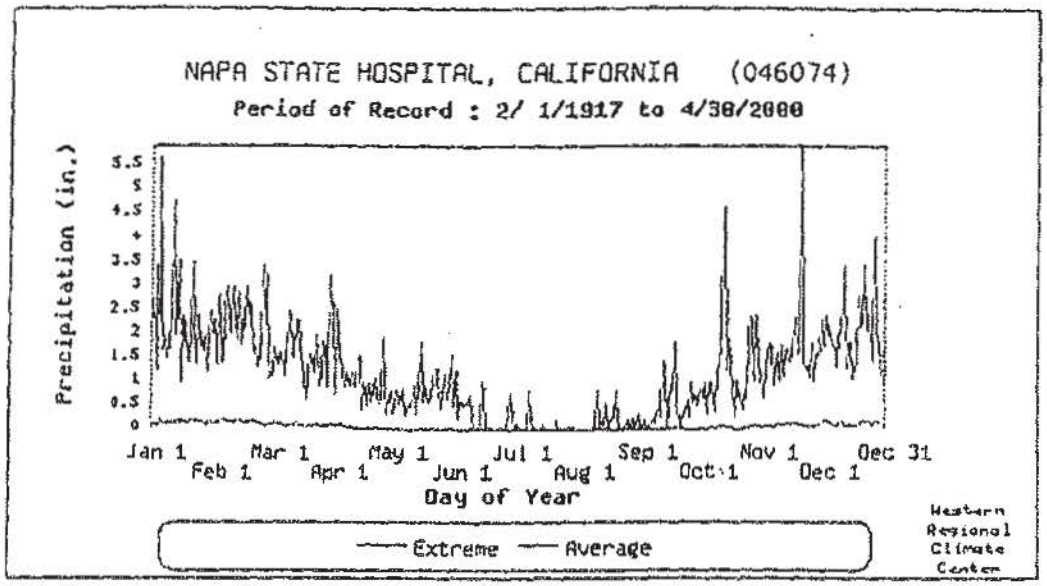


Figure 2: Means and Extremes for period of record at Angwin and Napa

Westside conditions are much more varied because both substrates and vegetation are more varied than are seen on the east side. Soil mapping on the hillside vineyard areas of Napa Valley is not adequate for detailed evaluation of runoff-generating characteristics. Napa County soil survey mapping is generally not suitable for evaluating vineyard conversion risks for non-alluvial soils above the valley floor. Soil mapping by the Soil Conservation Service and, later, by the Natural Resources Conservation Service has concentrated on the soil characteristics in the top two feet of agriculturally significant soil materials[4]. Soil mapping is not generally done to

[4] See "Napa County Soil Hydrologic Groups" map from the Soil Survey Geographic Database (SSURGO), Napa County RCD.

the degree or refinement necessary for hillside land conversions. Ongoing conversions for vineyards thoroughly change the mapped soil characteristics (see next Section on need for EIR analyses).

The Napa Valley floor vineyard lands are generally mapped to what is called an Order 2 mapping level. Because the conversions on these lands took place a century or more ago and these alluvial-substrate soils are relatively flat lying and are either well drained or have long had augmented drainage facilities, erosion is not generally a problem. The Order 2 maps are quite accurate and detailed, as is appropriate for very valuable crops. The hillsides around the Napa Valley, however, are only mapped at 4th Order reconnaissance level in forests or, at best, 3rd Order levels (see Appendix B for discussion of this mapping standard). Those lesser standards were appropriate for the open range and recreational uses of the hillsides in the 1960's. New syntheses of those older survey maps (see http://www.ca.nrcs.usda.gov/mlra/NapaSSA) come with a caveat on each map that states:

> *Due to complex features of the landscape and map scale limitation accuracy, on-site field inspections should be conducted with staff from the Natural Resources Conservation Service or professional soil scientists to verify soil mapping unit characteristics..*

Thus, hillside soil maps in Napa County include lumped complexes or associations of undifferentiated soil types that cannot be mapped separately at a scale of 1:24,000. Under westside woodlands, these soils are largely interpreted from aerial photographs and often cannot be resolved to land units under about 40 acres. Further, soils on hillsides are generally defined as slope phases of an upland or better-developed soil that may be found at one site. This mapping convention means that soils mapped on hillslopes of greater than 15 percent are generalized and imprecise. This is particularly troublesome in Napa County where hilltop soils may be derived from volcanic ash with much clay content while hillside soils below those sites are developed on unrelated bedrock. This is one fundamental reason that slope steepness is a poor predictor of erodibility in parts of Napa County.

Soil characteristics including content of stones are very important attributes to predict erosion potential. Stone content is a primary characteristic of the erodibility estimate developed in the Modified Universal Soil Loss Equation as part of its K factor. This equation is the basis for both the runoff models that were developed by the Napa County RCD and for the calculations of sediment basin sizes produced by the agricultural engineering consultants who prepare some of the Erosion Control Plans for the County. But stones also have significant effects on the overall function of soil; particularly where high shrink-swell characteristics are inherited from volcanic-ash derived clay minerals (see previous discussion). Long millennia of trial and error in southern Europe have taught the great import of maintaining a surface lag or coating of stones to protect underlying soils from rainsplash and rill erosion. Soil moisture levels are maintained under stone cover, planting is easily effected through stone cover, tilling is unnecessary, and weed control need is minimized. Stones within the soil column do not contract during the dry summer months when clay-rich soils are shrinking, and thus passageways are established along the boundaries of the stones that can readily accommodate infiltration and root growth with the first intense fall or early winter rains. Various stone mulching methods are effective.

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The Napa County erosion control ordinances emphasize cover crop plantings of perennial grasses to effect the same kind erosion control. But grasses compete with vines for late summer soil water, are much less effective with initial infiltration capacity for the first winter rains, and do less to increase deep permeability in clay-rich soils. Where native stones are not present in a natural soil profile, as in parts of the west side, perennial grass cover-cropping may be a sound alternative.

To evaluate the ability of a site to develop a stone cover, the stone content of the soil mantle must be assessed. This usually requires a series of representative deep soil pits that are carefully logged. This information is not generally part of a routine agricultural soil survey because larger stones do not contribute to the conventional productivity of the site. But they are very important for soil erosion resistance and enhanced infiltration capacity.

West side soils, as evaluated on Mt. Veeder on the Chateau Potelle site, have less clay-rich subsoils than do east-side sites. Bedrock is closer to the surface, more fractured, and soils are not as subject to summer shrinkage. Less antecedent rainfall is necessary to saturate observed west-side soils so headwater stream and gully density is greater than on the east-side. Management of vineyard conversion sites on Mt. Veeder and similar sites around Mt. Veeder requires drainage infrastructure and larger sediment detention basins for a given vineyard area. At Ch. Potelle, we observed that old vineyards that had been regraded and replanted were able to absorb about two-thirds less rainfall than the undisturbed forest-floor sites immediately adjacent could absorb[5]. Newly converted lands, with slightly higher clay contents than those of the old vineyard lands, could absorb about one-fourth of the precipitation of "undisturbed" naturally vegetated lands. While this reduction in infiltration capacity and resulting increase in runoff is substantially less than we observed on the east-side, it is still significant. It still demonstrates that the modeling that was a basis for the Napa County Erosion Control Ordinance is incorrect.

Most significantly, it is not simply the size of the sediment retention basins that should be at issue, but it is the shape and volume of runoff basins that should be the focus of the ordinance. A sediment basin can also be designed to capture runoff. At all observed sites in Napa County we noted that sediment basins had filled rapidly with runoff and had overflowed with only about 3 inches of rainfall in the fall of 1999. Bathtub rings of fine sediment at the elevation of overflow indicated that suspended sediment-bearing water had overflowed the detention basins.

The capacities of those basins were designed, in the observed east (Pahlmeyer) and west (Ch Potelle) Napa Valley sites, to accommodate 50-year return period sediment yield. That is, they were supposed to be designed to capture most sediment that could be generated in a major storm that would be expected once every 50 years. We found that the calculated sediment yields may have been accurate for the published soil information for the pre-conversion conditions, but were inadequate for the post-conversion conditions with drainage infrastructure. But most alarming was the fact that no accommodation was made to capture the increased runoff of water and suspended sediment. The ponds were sized assuming that all waterborne sediment somehow had time to settle out in a small circular basin, and that the "excess" water could be discharged downslope without further concerns.

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[5] Two-inch, 24-hour rainfall event, which can be expected several times in an average year. These estimates are based on field-derived estimates of soil pore volumes and soil density assessed in late December.

Erosion blankets, jute netting, straw-bales, filter fabric, and geotextiles were placed in many instances on the outflow channels below the sediment basins, but these did not extend far downslope or carry to the natural watercourses. They protected the integrity of the sediment basins themselves but not the watersheds below them, where the increased runoff was concentrated. Thus, the sediment basins served to control some of the coarse sediment coming from the conversion sites but, by so doing, increased the erosion offsite below the new vineyards. For a hilltop site like Pahlmeyer, this left a long exposed series of rills and channels to erode into Millikin reservoir. For a hillside site like Ch. Porelle, the tributary creeks were immediately below and adjacent to the vineyard plantings and were protected with riparian buffers, thus relying on root cohesion in those buffers to minimize in-channel erosion and subsequent reentrainment of sediment due to "hungry water" that now flows in volumes in excess of those before conversion. Reduction in offsite cumulative damage is therefore completely dependent on a continuous healthy riparian corridor between the vineyard sites and the Napa River tributaries. Where highways are adjacent to the creeks and the corridor is compromised, as for example Redwood Road and along Dry Creek, that rapid excess runoff simply satisfies its sediment needs by eroding downstream. The offsite effect of increase runoff volumes is independent of east or west side locations except where tributary streams pass through erodable materials, landslides, and oversteepened stream bank areas downstream. The Dry Creek and Redwood Creek canyons in their lower reaches are examples of tributaries that are susceptible to increased downstream erosion associated with increased upstream water yield.

The foothills east of Mt. Veeder west of Yountville contain a Franciscan greywacke (sandstone) that is easily eroded and that appears to be highly fractured by local faulting. This is the site of the Vineyard Properties West developments inspected near the headwaters of Hopper Creek. These are also sites where downstream impacts of upstream changes in runoff were most readily apparent. Tributary stream channels are incised, often deeply, and banks are unstable (for example, Hopper Creek from its very headwater to Yountville). As streams incise, landslides and small slumps occur, further increasing the rate of sediment discharge to those streams. Vineyard development increases water yield faster than it increases sediment yield, so the runoff is "hungry" or sediment-deprived. That sediment carrying capacity is almost immediately met by local bed and bank erosion in the stream channels, as is seen in Redwood, Dry, and Hopper Creeks. While vineyards are not the only sources of that increased runoff, they contribute to the downstream cumulative hydrologic effects, and should be evaluated in that context.

At Vineyard Properties West we noted clear evidence of recent streambed and bank erosion and marked (2 meter) stream incision of middle and upper Hopper Creek that could only be attributed to land clearing and vineyard conversion. Coarse gravel and sand fractions of that eroded stream bed were apparently captured in a local reservoir that was seen to have reduced storage capacity, while fine-grained sediments passed through that residual reservoir and entered the lower creek and passed down into the Napa River.

ONGOING AND NEEDED FUTURE WORK

Further work is in progress that evaluates the existing streamflow record for the tributaries and the main stem of the Napa River. This work is specifically focused on detection of the signatures of cumulative hydrologic effects and the separation of those stream flow change signals from many sources of background noise caused by channel clearing, alteration, precipitation-intensity changes, etc.

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APPENDIX B - SOIL MAPPING STANDARDS APPLICABLE TO NAPA VALLEY AND ENVIRONS

As stated in the Soil Survey Manual [4]:

> Third-order surveys are made for land uses that do not require precise knowledge of small areas or detailed soils information. Such survey areas are usually dominated by a single land use and have few subordinate uses. The information can be used in planning for range, forest, recreational areas, and in community planning.
>
> Field procedures permit plotting of most soil boundaries by observation and interpretation of remotely sensed data. Boundaries are verified by some field observations. The soils are identified by traversing representative areas and applying the information to like areas. Some additional observations and transects are made for verification. Map units include associations, complexes, consociations, and undifferentiated groups. Components of map units are phases of soil series, taxa above the series, or they are miscellaneous areas. Delineations have a minimum size of about 1.6 to 16 hectares (4 to 40 acres), depending on the survey objectives and complexity of the landscapes. Contrasting inclusions vary in size and amount within the limits permitted by the kind of map unit used. Base map scale is generally 1:20,000 to 1:63,360, depending on the complexity of the soil pattern and intended use of the maps.

[4] (USDA, 1993, http://www.snrlab.iastate.edu/soils/ssm/gen_cont.html)

Watershed Systems
Hydrology - Geology - Soil Science

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May 7, 2008

Thomas Lippe
Law Offices of Thomas N. Lippe
329 Bryant Street, Suite 3D
San Francisco, CA 94107

Dear Mr. Lippe,

You have asked that I address the specific hydrologic and sediment issues that may be associated with program implementation for the **Napa River Watershed Sediment TMDL and Habitat Enhancement Plan.** These are the issues that are the focus of pp 93-120 in the Staff Report for current version of the proposed Napa River TMDL. I had not noticed that the checklist format and abbreviated discussion of impacts of the implementation program itself did not really address the environmental impact of the proposed actions. That section of the staff report conveys an impression that the Napa County regulations that govern land use conversions to vineyards in the hillside areas of Napa County will meet the goals of the TMDL with State Board oversight as proposed in the TMDL implementation plan.

However, my prior extensive reports and analyses of specific conversion projects in Napa County have all demonstrated that you cannot simultaneously reduce sediment yield with engineering structures and flow routing while maintaining or reducing peak flow runoff. The belief that the proposed TMDLs will meet or exceed water quality standards when implementation of the TMDL must rely on land use regulations that are not within the control of the Regional Board needs to be reconsidered. In my opinion, it may be possible to implement the TMDL and meet its goals with local control, but that has not been demonstrated to date and the bulk of the evidence suggests that in the specific case of Napa County, there is an entire land-use engineering industry that has not been able to deal with impacts of peak flow increases associated with land conversions.

The source-area erosion control technology promoted by the consultant community in Napa County is good and seems to be improving through time. But the engineering solutions for headwater source-area sediment yield reduction and/or local capture of sediments almost invariably result in greater off-site, downstream, concentration of runoff that then leads to bank and streambed erosion to balance sediment load with the increased stream power. It seems that recommendations for more and larger-capacity on-site runoff detention are largely ignored in favor of reduced sediment concentration in that runoff.

This is understandable. It is more expensive in terms of money and land resources to capture and recharge the volumes of water that are yielded with a land use conversion from native vegetation to vineyard than it is to control sediment yield. The consulting reports done for Napa County to meet their Erosion Control Ordinance requirements almost always utilize the Natural Resource Conservation Service's older Soil Conservation Service map soil unit characteristics as the basis for calculating comparative before- and after- yields of sediment and water that are to result from a proposed land conversion. By using the broad scale map unit soil descriptions for the sites as they existed in the 1960's and 1970's before conversion, consultants are able to show to the satisfaction of Napa County Planning staff and its Rural Conservation District that a proposed conversion will either not increase runoff at all, while capturing sediment, or will not have a significant environmental impact on the channels or watercourses of the conversion site.

As I have repeatedly pointed out to Napa County in my reviews of Erosion Control Plans, most vineyard conversions significantly change the hydrologic characteristics of the soil substrate in the new vineyard areas. The single most important factor in this change is the removal of surface stones and/or deep-ripping of soils on hillsides. Either of these common vineyard preparation activities changes the porosity and permeability of surface soils, sometimes in ways that increase runoff for a given high-intensity storm event. When these changes are coupled with constructed lined drainage ditches, culverts, and other erosion control structures, the net result is an increased rate of runoff for higher intensity storms.

What is critical for the proposed TMDL is an appreciation the fact that most of the deleterious land use activities that affect water quality do so only infrequently. The average year's rainfall is not a significant geomorphic agent of erosion. The mean annual channel flood does not significantly alter the banks and bed of that channel. It is the 15-30 year interval intensity-duration rainfall events that wipe our fisheries, erode channel banks, move gravel bars, and flood the surrounding country side. A cover-crop of grasses planted in a vineyard to compensate for leafless vines that have replaced native chaparral cannot emulate the pre-conversion hydrologic characteristics.

Despite the great and sincere research efforts that went into this TMDL, the significant differences in impacts of conversion of stony east-side Napa Valley chaparral-covered hillsides to vineyard are not the same as those when oaks and other trees are cleared from some geologic substrates on the west side or southern foothills of the County. Until and unless the County Planners can demonstrate that they understand how to balance both sediment yield and water yield to minimize offsite, downstream impacts, the "checklist" included in the Staff Report on pp. 100-101 dealing with hydrology and water quality cannot be considered accurate.

For example: Section VII: Would the Project – c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion of siltation on- or off-site?

Yes, most certainly! Yet "less than significant impact" is checked. Presumably, "of" siltation is a typographic error and should be "or" siltation. The *project* is the *action* of the TMDL to implement its requirements through continued use of Napa County Erosion Control Plans. Yet we have repeatedly shown that these plans underestimate off-site

channel erosion and often underestimate on-site erosion for geomorphically-significant expected storm events.

Part d asks: d) Would the Project: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

Again "less than significant impact" is checked. Yet the existing practice of the Erosion Control Plans approved by Napa County to recommend engineered drains and extensive collector systems to prevent on-site erosion in the vineyards and their vineyard roads does in-fact speed and concentrate runoff that is then discharged off-site into tributary ephemeral and intermittent stream courses from which it is carried to the Napa River.

The fact that "reasonably foreseeable compliance projects'" are listed to include earthmoving and minor construction does not address the environmental impact of these "foreseeable compliance projects". We are told, [Section VIII, part c] *Specific projects involving earthmoving or construction activities to comply with requirements derived from the proposed Basin Plan amendment are reasonably foreseeable. Such projects could affect existing drainage patterns. However, to meet proposed Basin Plan amendment allocations, they would be designed to reduce overall soil erosion, not increase it. Nevertheless, temporary earthmoving operations could result in short-term, limited erosion. These specific compliance projects would be subject to the review and/or approval of the Water Board, which would require implementation of routine and standard erosion control best management practices and proper construction site management. In addition, construction projects over one acre in size would require a general construction National Pollutant Discharge Elimination System permit and implementation of a storm water pollution prevention plan. Therefore, the Basin Plan amendment would not result in substantial erosion, and its impacts would be less-than significant.* [Staff Report, pp 113-114]

But the reduction of soil erosion does not offset increased off-site peak flow increases. You can reduce soil erosion on the hillslope while simultaneously increasing it along the channels downstream. These are difficult issues to resolve and require very thorough and continuing diligence. This is the nexus of a cumulative hydrologic effect. The recommended structural drainage facilities such as culverts, lined ditches, and drainage channels as applied over large areas of Napa Valley will reduce sediment input from uplands but will exacerbate off-site channel and stream-bed erosion through increased yield of runoff. The public and the fish in the Napa River are directly impacted by the cumulative downstream impacts of increased frequency and duration of flood flows in the main river and its primary tributaries. The sediment addressed by the TMDL is also important but cumulative effects analyses must also include the changed flow characteristics.

Respectfully Submitted:

Robert R. Curry, Registered Geologist

CURRICULUM VITA

Robert R. Curry

Research Professor, University of California Santa Cruz; Research Coordinator and Senior Scientist, California State University Monterey Bay, Watershed Institute and Adjunct Professor, Earth Systems Science and Policy, California State University.

Research Specialties:

Fluvial Geomorphology, Wetlands and Stream Restoration, Wetland Delineation, Watershed Systems, Land and Habitat Restoration

1. EDUCATION

PhD: University of California, Berkeley, Department of Geology & Geophysics, 1967 in Geomorphology & Paleoclimatology

2. *PROFESSIONAL –REGISTRATION* *Registered Geologist California #3258*

3. CONTEMPORARY ACTIVITIES

1982-present: Estuarine and freshwater stream restoration projects. Primary research with students on restoration of damaged estuarine ecosystems. Pescadero Marsh Management Plan study for California Dept. of Parks and Recreation. Schwan Lake restoration plan, 1991-95. San Lorenzo river restoration planning, 1986-96; Lahontan Regional Water Quality Control Board regional wetland restoration 1991-ff., 1998-ff San Mateo and Santa Barbara Counties with L.C. Lee & Assoc; 1999-2002 Salinas River and Carmel Valley TMDL Sediment/Salmonid studies with Regional Board and CDF&G.

4. *Selected PUBLICATIONS*

7.1. -Books and Monographs

(1) Curry, R.R., and Wahrhaftig, Clyde, 1967, Geologic Implications of Sediment Discharge from the Northern Coast Ranges, California: p. 35-60 in Goldman, C.R., (ed), Man's Effect on California Watersheds, Section 3; Inst. of Ecology, University of California, Davis, Calif. 434 p.

(3) Curry, R.R., 1968, Quaternary Climatic and Glacial History of the Sierra Nevada, California: Univ. Microfilms 68-13,896; Ann Arbor, Mich., 238 p. (PhD thesis, University of California, Dept. of Geology and Geophysics, 1968).

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(4) Curry, R.R., 1969, Holocene Climatic and Glacial History of the Central Sierra Nevada, p. 1-47, Special Paper 123, Geol. Soc. America.
(7) Curry, R.R., 1971, Glacial and Pleistocene History of the Mammoth Lakes Sierra: Univ. Montana, Dept. Geology, Geol Series Publ. 2, 50 pp + map.
(18) Burke, Mary T., R. Curry, J. Major, and D. Taylor, 1982, Natural Landmarks of the Sierra Nevada. U.S. Dept. Interior, National Park Service, Conservation and Recreational Services Division. Landmark Survey of the Sierra Nevada, 529 p.
(20) Kondolf, G.M., John Williams, and R. R. Curry, 1983, Channel Stability and Fish Habitat, Carmel River, California. Field Conference Guidebook for Symposium and Field Conference, Monterey Peninsula College, Monterey, Calif. June 16-18, Monterey Peninsula Water Management District, 76 p.
(21) Curry, R. R., 1985, Sedimentologic and Hydrologic Analysis of Pescadero Marsh and its Watershed. Report to State of California, Dept. of Parks and Recreation, 110 pp.
(22) Curry, R. R., and A. Beth Dyer (eds), 1992, The current status of Schwan Lagoon, Santa Cruz County, California and some management considerations. A compilation of technical reports. Univ. of California Santa Cruz, 96 p.

7.2. -Selected Journal and web papers and book chapters

(2) Curry, R.R., and Clyde Wahrhaftig, 1966, Geologic Implications of Sediment Discharge Records from the Northern Coast Ranges, California. Report to the California state Assembly Committee on Natural Resources, Planning, and Public Works; Sub-committee on Forest Practices and Watershed Management, August, Sacramento, Calif., 22 p.
(20) Curry, R.R., 1970, A proposal for ecological refugia: Intecol Bulletin, v. 1, p. 3-7.
(22) Curry, R.R., 1971, Soil destruction associated with forest management and prospects for recovery in geologic time: Assoc. Southeastern Biologists Bull. v. 18, no. 3, p 117-128.
(27) Curry, R.R., 1973, Reclamation of Arid Western Lands: Montana Outdoors, v. 4, no. 3, p 18.
(31) Curry, R.R., 1975, Practices and problems of land reclamation in western North America: Biogeochemical limitations on western reclamation—the high Northern Great Plains example. p. 18-47 *in*: Wali, M.K. (ed), Practices and Problems of Land Reclamation in western North America, Univ. North Dakota Press, Grand Forks, 196 p.
(32) Curry, R.R., 1976, Downstream effects of runoff changes, p. 251-262 *in*: Sharma, Raj, D. Buffington, and J. McFadden (eds), Proceedings of the workshop on biological significance, Argonne National Laboratories. U.S. Nuclear Regulatory Comm., NR-CONF-002, Wash. D.C., 327 p.
(36) Curry, R.R., 1977, Watershed form and process: The elegant balance. p. 14-21 in: CoEvolution Quarterly, winter 1976-77.
(39) Curry, R.R., 1977, Watershed Systems and Policy Planning, p. 47-61 in: Inst. for Policy Studies, Portland State University, Water for Oregon's Future, Inst. for Policy Studies, Portland, 144 p.
(47) Curry, R. R., 1981, Watershed Form and Process: The Elegant Balance. Chapt 20 (p. 319-340) *in* Emery, F.E. (ed), "Systems Thinking", Vol. 2, Penguin Books, Middlesex, England, 474 p. Penguin Modern Management Readings, Education Series, published simultaneously by Penguin Books, New York; Victoria, Australia; Markham, Ontario, Canada; and Auckland, New Zealand.

(49) Curry, R.R., and G.M. Kondolf. 1981. Strategy for restoration of channel stability, Carmel River, Monterey County, CA. in Watershed Rehabilitation in Redwood National Park and Other Pacific Coastal Areas. Proceedings of a Symposium, August 24-28, 1981. Arcata, California. pp. 191-208.

(50) Kondolf, G. M., and R. R. Curry, 1984, Role of Riparian Vegetation in stream channel equilibrium: The Carmel River Example, Monterey County, California. pp. 124 - 133 *in* Warner, R.E. and K.M. Hendrix (eds), California Riparian Systems, Univ. Calif. Press, Los Angeles.

(51) Curry, R.R. and W. Oechel, 1984, Shrubland Ecosystem Dynamics, Chapt 8, p. 98-103, *in* J.J. deVries (ed), Shrublands in California: Literature Review and Research Needed for Management. Water Resources Center, Univ. of California, Davis, Calif., June, 1984.

(52) Kondolf, G.M., and R.R. Curry, 1986, Channel Erosion along the Carmel River, Monterey Co., Calif. Earth Surface Processes and Landforms, v. 11,, no. 3, pp. 307-319.

(53) Curry, R.R., 1987, Water quality protection in forest management: Are Best Management Practices working?, pp. 55-61 *in* Callaham, R.Z., and J.J. DeVries (eds), Proceed. of the California Watershed Management Conference, Nov. 18-20, Sacramento, Calif. Wildland Resources Center, Univ. Calif., Berkeley, Rept. 11, 167 p.

(54) Curry, R. R., 1992, Eastern Sierra Nevada Wetland Assessment: Bridgeport Basin Study Site—Climatic change, irrigation, and wetland boundaries. pp 396-414 *in* The History of Water— White Mountain Research Station Symposium Volume 4, Clarence A. Hall, Jr., et al (eds), University of California White Mountain Research Station, Los Angeles, Calif., 453 p.

(55) Curry, R.R., 1999, Science Review: Sierra Nevada Ecosystem Project. Pp. 321-325 *in*: Bioregional Assessments: Science at the Crossroads of Management and Policy, N.K. Johnson, et al, (eds) Island Press, Wash. D.C., 398 p

(56) Curry, R.R. 1999, Pacific Lumber Company proposed Habitat Conservation Plan and Sustained Yield Plan Draft EIR technical review. http://www.wildcalifornia.org/pages/hcp_review.html 19 p

(57) Fred Watson, Bob Curry, Scott Hennessy, Wendi Newman, Thor Anderson, Lars Pierce, Joel Casagrande, Julie Hager, Don Kozlowski, Alana Oakins, Bronwyn Feikert, Joy Larson, Brian Londquist, Wright Cole, Adrian Rocha. (2000). The Salinas Sediment Study - a hands on, research and community-based approach to TMDL development. Oral presentation and Proceedings. 8th Biennial Watershed Management Council conference, Nov. 27-30, Asilmoar Beach, California, USA.

(58) Thor Anderson, Wendi Newman, Fred Watson, Adrian Rocha, Don Kozlowski, Joel Casagrande, Alana Oakins, Julie Hager, Wright Cole, Bob Curry. Sediment in furrows, farms, and forests – multi-scale measurements for multi-scale modelling and management. Poster presentation and abstract, AGU Fall Meeting 2000.

(59) W. Newman, T. Anderson, F. Watson, R. Curry, S. Hennessy, L. Pierce, J. Casagrande, J. Hager, D. Kozlowski, A. Oakins, B. Feikert, J. Larson, B. Londquist, W. Cole, A. Rocha. (2000). The Salinas Sediment Study - the challenge of monitoring just about everything in a watershed where we know just about nothing. Poster presentation. 8th Biennial Watershed Management Council conference, Nov. 27-30, Asilmoar Beach, California, USA.

(60) Watson, F., Newman, W., Anderson, T., Casagrande, J., Hager, J. Kozlowski, D., Rocha, A., Oakins, A., Feikert, B., Cole, W., Londquist, B., Curry, R., Hennessy, S., Pierce, L., & Angelo, M. 2001, The Salinas Sediment Study. Report to the Central Coast Regional Water Quality Control Board, San Luis Obispo, California.

Watershed Institute, California State University Monterey Bay, Seaside, California, USA.

7.3. -Selected Professional Reports to Public Agencies

(1) Curry, R.R., 1972, Geologic report for Baca Land and Cattle Co., vs. New Mexico Timber Co.; Valles Caldera, New Mexico: For Dunnigan Enterprises, Inc., Abilene, Texas. On impacts of timber removal from prospective National Park site.
(9) Curry, R.R., 1973, Hazard geology and soils of the proposed Sherwin Bowl ski area, Mono Co., Calif. For: U.S. Forest Service, Inyo N.F.
(14) Curry, R.R., 1974-1975, Geologic considerations of location of U.S. 395 near Sherwin Summit, Mono County, Calif. For: Caltrans on protection of geologic locality to be impacted by highway construction.
(19) Curry, R.R., 1974, Geologic Hazards and Planning Considerations for the June Lake Loop Area, Mono County, Calif. -General Plan Safety Element for: Ingmire-Patri land planners, through Sedway-Cooke, San Francisco, To the U.S. Forest Service - contracted report of about 100+ pp. + appendices. Incorporated into the initial June Lake Loop General Plan, Mono Co., Calif.
(20 Curry, R.R., 1977, Contribution to report of the U.S. Fish and Wildlife Service, Western Energy and Land Use Team report: Clarification and standardization of the definition, purpose, and practice of ecological baseline studies in western energy development areas. Ecological Consultants, Inc. Ft. Collins, Colo. I served as advisor to USFWS on this study.
(30) Keller, E.A., R.R. Curry, and Paul Seidleman, 1982, Watershed Rehabilitation in Redwood National Park: A Critical Evaluation. Center for Natural Resource Studies, Berkeley, Calif.
(31) Curry, R.R., 1986-88, Calif. Dept. of Parks and Recreation, Pescadero Lagoon and Pescadero Creek management problems. Technical review and input to management plan based upon my 1985 report. San Mateo County.
(32) Curry, R.R., 1986-87, Sierra Club and others; technical reviewer for environmental assessment of Barstow to Las Vegas off-road vehicle races. Written original field-based analysis and evaluation of Bureau of Land Management's analysis.
(33) Emery, Brett, and R.R. Curry, 1988, Mono County Planning Commission "Natural Resources Inventory, Mono County, Calif." with student Brett Emery, 25 pp report and public presentation to accompany Mr. Emery's field based senior thesis.
(34) Curry, R.R., 1992, Final Report, Bridgeport Wetland Delineation, 36 pp + map, to Mono County and Lahontan Regional Water Quality Control Board.
(35) Curry, R.R., 1993, Identification and Location of Beneficial Uses of Wetlands; 200+ pp + 1000+ maps + database. To: Lahontan Regional Water Quality Control Board.
(36) Curry, R.R., C.E. Christian and B.E. Emery, 1996, Mono County, California delineation of certain wetlands and policy recommendations for site-specific restoration mitigation banking. To: Lahontan Regional Water Quality Control Board, 50 pp + maps and data sheets.
(37) Curry, R. R., B. Emery, and C. Christian. 1996. Development of specific plans and policies to avoid or mitigate the impacts of future development in certain Mono County wetlands. Final Report prepared for the California Regional Water Quality Control Board, Lahontan Region. Contract No. 4-075-160-0, derived from U. S. Environmental Protection Agency Assistance Agreement.
(38) Smith, Douglas; Curry, Robert, et al, 2002, Watershed and Riparian Assessment Report (WRAR): Bureau of Land Management, Fort Ord, Monterey County, California, 85 p.

Attachment 23

Napa County Department of Public Works - Traffic Volumes

			A	B	C	D	E	F	G	H	I
Road Name	**ID**	**Location**	**Direction**	**Date**	**ADT**	**AM Peak time**	**AM Peak vol**	**PM Peak time**	**PM Peak vol**	**Peak Day**	**Peak Day vol**
Aetna Springs Road	N/A	West of Butts Canyon Road / Butts Canyon Road	East	05/09/07	174	10:45	16	15:45	33	05/10/07	219
Aetna Springs Road	N/A	West of Butts Canyon Road / Butts Canyon Road	West	05/09/07	172	6:00	26	13:15	14	05/10/07	215
Airport Boulevard	N/A	West of State Highway 29	East	07/04/03	1796	11:00	180	16:30	298	07/07/03	3119
Airport Boulevard	N/A	West of State Highway 29	West	07/04/03	2195	7:45	477	12:45	238	07/09/03	3564
Atlas Peak Road	N/A	North of State Highway 121	North	07/10/03	3129	7:30	239	16:30	243	07/11/03	3765
Atlas Peak Road	N/A	North of State Highway 121	South	07/10/03	3229	11:00	267	15:45	334	07/11/03	3689
Bale Lane	01	East of State Highway 29/128	East	03/25/03	484	8:15	36	12:30	44	03/25/03	527
Bale Lane	01	East of State Highway 29/128	West	03/25/03	502	7:30	49	15:15	49	03/25/03	549
Bale Lane	02	West of Silverado Trail	East	03/25/03	398	7:45	29	15:15	41	03/25/03	435
Bale Lane	02	West of Silverado Trail	West	03/25/03	415	7:30	44	16:30	41	03/25/03	467
Barnett Road	N/A	East of Chiles-Pope Valley Road	East	06/20/07	90	5:00	30	15:00	6	06/21/07	104
Barnett Road	N/A	East of Chiles-Pope Valley Road	West	06/20/07	91	11:00	6	15:15	24	06/21/07	102
Bella Oaks Lane	N/A	West of State Highway 29	East	03/04/05	91	9:45	10	15:45	12	03/07/05	109
Bella Oaks Lane	N/A	West of State Highway 29	West	03/04/05	91	6:15	14	12:45	10	03/07/05	112
Berryessa-Knoxville Road	01	North of State Highway 128	North	04/28/04	921	11:00	51	16:30	57	05/02/04	1592
Berryessa-Knoxville Road	01	North of State Highway 128	South	04/28/04	913	6:00	47	15:30	48	05/02/04	2253
Berryessa-Knoxville Road	02	South of Mulford Drive	North	04/28/04							
Berryessa-Knoxville Road	02	South of Mulford Drive	South	04/28/04							
Berryessa-Knoxville Road	03	North of Mulford Drive	North	04/28/04	737	11:00	35	12:30	47	05/02/04	1252
Berryessa-Knoxville Road	03	North of Mulford Drive	South	04/28/04	731	6:45	39	15:45	40	05/02/04	1721
Berryessa-Knoxville Road	04	South of Sugarloaf	North	04/28/04							
Berryessa-Knoxville Road	04	South of Sugarloaf	South	04/28/04							
Berryessa-Knoxville Road	05	North of Sugarloaf	North	04/28/04	741	11:00	42	13:00	47	05/02/04	1264
Berryessa-Knoxville Road	05	North of Sugarloaf	South	04/28/04	732	6:00	36	15:00	42	05/02/04	1718
Berryessa-Knoxville Road	06	South of Spanish Flat Loop Road - South	North	04/28/04	735	11:00	42	13:00	47	05/02/04	1248
Berryessa-Knoxville Road	06	South of Spanish Flat Loop Road - South	South	04/28/04	733	5:45	36	15:00	42	05/02/04	1722
Berryessa-Knoxville Road	07	North of Spanish Flat Loop Road - South	North	04/28/04	670	11:00	41	13:00	42	05/02/04	1213
Berryessa-Knoxville Road	07	North of Spanish Flat Loop Road - South	South	04/28/04	682	10:45	29	15:15	37	05/02/04	1697
Berryessa-Knoxville Road	08	South of Spanish Flat Loop Road - North	North	04/28/04	668	11:00	41	13:15	42	05/02/04	1201
Berryessa-Knoxville Road	08	South of Spanish Flat Loop Road - North	South	04/28/04	688	10:45	30	15:15	38	05/02/04	1718
Berryessa-Knoxville Road	09	North of Spanish Flat Loop Road - North	North	04/28/04	678	11:00	43	12:45	44	05/02/04	1215
Berryessa-Knoxville Road	09	North of Spanish Flat Loop Road - North	South	04/28/04	678	10:45	29	15:15	38	05/02/04	1692
Berryessa-Knoxville Road	10	South of Putah Creek Road	North	04/28/04	361	11:00	20	16:45	22	05/02/04	577
Berryessa-Knoxville Road	10	South of Putah Creek Road	South	04/28/04	380	10:45	20	12:00	21	05/02/04	804
Berryessa-Knoxville Road	11	North of Putah Creek Road	North	04/28/04	359	10:45	15	12:15	22	05/02/04	603
Berryessa-Knoxville Road	11	North of Putah Creek Road	South	04/28/04	356	11:00	13	13:00	21	05/02/04	781
Berryessa-Knoxville Road	12	South of Pope Pope Canyon Road	North	04/28/04	314	10:00	13	13:00	14	05/02/04	619
Berryessa-Knoxville Road	12	South of Pope Pope Canyon Road	South	04/28/04	362	11:00	14	13:00	21	05/02/04	805
Berryessa-Knoxville Road	13	North of Pope Canyon Road	North	04/28/04	268	11:00	16	14:45	17	05/01/04	530
Berryessa-Knoxville Road	13	North of Pope Canyon Road	South	04/28/04	262	10:30	15	12:00	16	05/01/04	453
Berryessa-Knoxville Road	14	Napa / Lake County Line	North	04/28/04	40	11:00	4	13:30	4	05/01/04	73
Berryessa-Knoxville Road	14	Napa / Lake County Line	South	04/28/04	33	9:30	4	12:15	3	05/01/04	56
Big Ranch Road	01	Napa City Limit	North	07/31/07	3224	7:30	227	16:30	311	08/03/07	3579
Big Ranch Road	01	Napa City Limit	South	07/31/07	3369	10:45	231	16:15	416	08/03/07	3858
Big Ranch Road	01	Napa City Limit	North	07/23/09	3164	8:00	203	16:30	306	07/28/09	3426
Big Ranch Road	01	Napa City Limit	South	07/23/09	3308	11:00	219	15:45	378	07/28/09	3656
Big Ranch Road	02	South of El Centro Avenue	North	07/31/07	2291	7:45	180	16:45	254	08/03/07	3579
Big Ranch Road	02	South of El Centro Avenue	South	07/31/07	2347	7:45	183	16:00	328	08/03/07	3718
Big Ranch Road	02	South of El Centro Avenue	North	07/23/09	3054	8:00	197	16:30	290	07/28/09	3324
Big Ranch Road	02	South of El Centro Avenue	South	07/23/09	3282	11:00	218	15:30	382	07/28/09	3613
Big Ranch Road	03	North of El Centro Avenue	North	07/31/07	2495	7:15	214	16:45	220	07/31/07	2735
Big Ranch Road	03	North of El Centro Avenue	South	07/31/07	2892	10:45	187	15:45	454	07/31/07	3336
Big Ranch Road	03	North of El Centro Avenue	North	07/23/09	2411	7:15	191	16:00	207	07/24/09	2619

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Big Ranch Road	03	North of El Centro Avenue	South	07/23/09	2771	11:00	172	15:45	406	07/24/09	3103
Big Ranch Road	04	South of Salvador Avenue	North	07/31/07	2459	7:30	206	16:45	219	07/31/07	2715
Big Ranch Road	04	South of Salvador Avenue	South	07/31/07	2780	10:45	181	15:45	446	07/31/07	3219
Big Ranch Road	04	South of Salvador Avenue	North	07/23/09	2316	7:15	187	15:00	197	07/27/09	2458
Big Ranch Road	04	South of Salvador Avenue	South	07/23/09	2734	11:00	169	15:30	410	07/27/09	3115
Big Ranch Road	05	North of Salvador Avenue	North	07/31/07	1849	7:15	208	14:45	132	08/03/07	2093
Big Ranch Road	05	North of Salvador Avenue	South	07/31/07	2229	11:00	132	16:15	429	08/03/07	2620
Big Ranch Road	05	North of Salvador Avenue	North	07/23/09	1700	7:15	186	14:45	129	07/29/09	1921
Big Ranch Road	05	North of Salvador Avenue	South	07/23/09	2078	11:00	117	15:45	384	07/29/09	2395
Big Ranch Road	06	South of Oak Knoll Avenue	North	07/31/07	1716	7:30	197	14:45	124	08/03/07	1978
Big Ranch Road	06	South of Oak Knoll Avenue	South	07/31/07	2103	11:00	124	16:30	411	08/03/07	2489
Big Ranch Road	06	South of Oak Knoll Avenue	North	07/23/09	1595	7:15	180	13:30	122	07/24/09	1771
Big Ranch Road	06	South of Oak Knoll Avenue	South	07/23/09	2008	11:00	113	15:30	384	07/24/09	2292
Big Ranch Road	07	North of Oak Knoll Avenue	North	07/31/07	207	10:45	17	12:00	21	08/02/07	241
Big Ranch Road	07	North of Oak Knoll Avenue	South	07/31/07	209	9:45	22	14:45	23	08/02/07	237
Big Ranch Road	07	North of Oak Knoll Avenue	North	07/23/09	207	6:30	18	14:45	19	07/27/09	252
Big Ranch Road	07	North of Oak Knoll Avenue	South	07/23/09	242	10:45	20	14:45	38	07/27/09	284
Big Tree Road	N/A	East of State Highway 29/128	East	04/04/03	38	9:15	5	12:00	5	04/04/07	52
Big Tree Road	N/A	East of State Highway 29/128	West	04/04/03	39	10:00	5	12:00	6	04/04/07	57
Brannen Street	N/A	West of Silverado Trail	East	03/04/03	562	7:30	51	15:15	51	03/07/03	617
Brannen Street	N/A	West of Silverado Trail	West	03/04/03	558	10:45	42	15:30	76	03/07/03	639
Butts Canyon Road	01	North of Aetna Springs Road	North	05/09/07	809	10:00	27	16:00	147	05/11/07	987
Butts Canyon Road	01	North of Aetna Springs Road	South	05/09/07	816	7:00	118	15:45	47	05/11/07	852
Butts Canyon Road	02	South of James Creek Road	North	04/25/07	809	8:15	30	16:30	137	04/27/07	943
Butts Canyon Road	02	South of James Creek Road	South	04/25/07	827	6:00	135	15:45	47	04/27/07	942
Butts Canyon Road	03	North of James Creek Road	North	04/25/07	796	11:00	29	16:30	141	04/27/07	950
Butts Canyon Road	03	North of James Creek Road	South	04/25/07	762	6:15	133	15:30	37	04/27/07	867
Butts Canyon Road	04	South of Snell Valley Road	North	04/25/07	767	6:00	135	15:45	44	04/27/07	864
Butts Canyon Road	04	South of Snell Valley Road	South	04/25/07	724	11:00	27	16:30	114	04/27/07	869
Butts Canyon Road	05	North of Snell Valley Road	North	05/09/07	606	10:00	27	16:00	113	05/11/07	740
Butts Canyon Road	05	North of Snell Valley Road	South	05/09/07	578	5:15	83	15:45	35	05/11/07	595
Butts Canyon Road	06	Napa / Lake County Line	North	04/25/07	603	7:00	25	16:30	108	04/27/07	710
Butts Canyon Road	06	Napa / Lake County Line	South	04/25/07	571	6:00	90	15:45	32	04/27/07	643
Café Court	N/A	West of Kelly Road South	East	04/08/04	195	10:00	19	13:00	23	04/11/04	482
Café Court	N/A	West of Kelly Road South	West	04/08/04	199	11:00	20	12:00	20	04/11/04	485
Camino Oruga	N/A	West of Kelly Road North	East	04/01/05	560	10:15	61	15:15	94	04/07/05	767
Camino Oruga	N/A	West of Kelly Road North	West	04/01/05	506	6:30	92	13:15	71	04/07/05	692
Chiles-Pope Valley Road	01	North of State Highway 128	North	06/19/07	406	5:00	60	16:45	43	06/22/07	547
Chiles-Pope Valley Road	01	North of State Highway 128	South	06/19/07	405	6:30	38	15:45	63	06/22/07	424
Chiles-Pope Valley Road	02	South of Lower Chiles Valley Road	North	06/19/07	380	5:15	57	16:45	40	06/22/07	511
Chiles-Pope Valley Road	02	South of Lower Chiles Valley Road	South	06/19/07	371	6:30	37	15:45	57	06/22/07	390
Chiles-Pope Valley Road	03	South of Lower Chiles Valley Road	North	06/19/07	469	5:15	67	16:00	48	06/22/07	607
Chiles-Pope Valley Road	03	South of Lower Chiles Valley Road	South	06/19/07	478	6:30	46	15:45	71	06/22/07	488
Chiles-Pope Valley Road	04	South of Pope Canyon Road	North	06/19/07	443	5:15	55	16:00	49	06/22/07	583
Chiles-Pope Valley Road	04	South of Pope Canyon Road	South	06/19/07	452	6:15	44	15:30	60	06/22/07	471
Chiles-Pope Valley Road	05	North of Pope Canyon Road	North	06/19/07	380	5:15	47	16:00	46	06/22/07	499
Chiles-Pope Valley Road	05	North of Pope Canyon Road	South	06/19/07	376	6:15	36	15:30	53	06/22/07	388
Chiles-Pope Valley Road	06	South of Pope Valley Crossroad	North	06/30/07	375	5:15	42	15:30	38	07/03/07	420
Chiles-Pope Valley Road	06	South of Pope Valley Crossroad	South	06/30/07	367	6:15	30	15:45	41	07/03/07	379
Chiles-Pope Valley Road	07	North of Pope Valley Crossroad	North	06/20/07	656	5:15	49	15:15	80	06/22/07	773
Chiles-Pope Valley Road	07	North of Pope Valley Crossroad	South	06/20/07	633	5:00	54	15:30	70	06/22/07	679
Chiles-Pope Valley Road	08	South of Barnett Road	North	06/20/07	635	4:15	48	14:15	77	06/22/07	736
Chiles-Pope Valley Road	08	South of Barnett Road	South	06/20/07	640	4:00	54	14:30	70	06/22/07	693
Chiles-Pope Valley Road	09	North of Barnett Road	North	07/10/07	610	8:00	35	15:45	83	07/13/07	676
Chiles-Pope Valley Road	09	North of Barnett Road	South	07/10/07	598	5:00	51	15:15	52	07/13/07	626
Chiles-Pope Valley Road	10	South of Howell Mountain Road / Pope Valley Road	North								

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Chiles-Pope Valley Road	10	South of Howell Mountain Road / Pope Valley Road	South								
Circle Oaks Drive	N/A	North of State Highway 128	North	02/08/08	363	11:00	14	17:45	61	02/08/08	406
Circle Oaks Drive	N/A	North of State Highway 128	South	02/08/08	359	6:45	76	14:30	21	02/08/08	401
Cold Springs Road	01	East of Howell Mountain Road	East								
Cold Springs Road	01	East of Howell Mountain Road	West								
Cold Springs Road	02	West of Las Posadas Road	East								
Cold Springs Road	02	West of Las Posadas Road	West								
Cold Springs Road	03	East of Las Posadas Road	East	01/28/03	226	9:00	11	17:45	30	01/31/03	265
Cold Springs Road	03	East of Las Posadas Road	West	01/28/03	228	8:30	32	13:30	20	01/31/03	259
Conn Creek Road	N/A	South of State Highway 128	North	08/22/08	325	6:15	40	12:00	30	08/25/08	356
Conn Creek Road	N/A	South of State Highway 128	South	08/22/08	559	11:00	42	15:45	105	08/25/08	758
Crystal Springs Road	01	West of Sanitarium Road	East								
Crystal Springs Road	01	West of Sanitarium Road	West								
Crystal Springs Road	02	East of North Fork Crystal Springs Road	East								
Crystal Springs Road	02	East of North Fork Crystal Springs Road	West								
Crystal Springs Road	03	West of North Fork Crystal Springs Road	East								
Crystal Springs Road	03	West of North Fork Crystal Springs Road	West								
Crystal Springs Road	04	East of Silverado Trail	East	03/25/03	204	6:15	48	12:15	16	03/25/03	233
Crystal Springs Road	04	East of Silverado Trail	West	03/25/03	184	8:45	16	15:30	42	03/25/03	209
Darms Lane	N/A	West of Solano Avenue	East	02/05/03	167	8:30	16	15:30	17	02/10/03	202
Darms Lane	N/A	West of Solano Avenue	West	02/05/03	166	11:00	12	15:30	18	02/10/03	209
Deer Park Road	01	East of State Highway 29/128	East	03/31/06	2659	8:00	211	17:00	274	04/03/06	3108
Deer Park Road	01	East of State Highway 29/128	West	03/31/06	2115	8:00	188	15:45	184	04/03/06	2514
Deer Park Road	02	West of Silverado Trail	East	03/31/06	2686	7:00	231	16:00	276	04/03/06	3243
Deer Park Road	02	West of Silverado Trail	West	03/31/06	2168	6:45	243	14:30	180	04/03/06	3081
Deer Park Road	03		East								
Deer Park Road	03		West								
Deer Park Road	04	West of Lower Sanitarium Road	East	08/13/07	3743	8:15	243	17:15	370	08/15/07	4236
Deer Park Road	04	West of Lower Sanitarium Road	West	08/13/07	3567	7:30	353	15:00	344	08/15/07	3981
Deer Park Road	05	East of Lower Sanitarium Road	East	08/13/07	2352	8:15	141	17:15	249	08/15/07	2645
Deer Park Road	05	East of Lower Sanitarium Road	West	08/13/07	2211	7:30	223	14:45	209	08/15/07	2476
Deer Park Road	06	West of Mund Road	East	11/06/07	1659	8:00	137	16:45	222	11/09/07	2648
Deer Park Road	06	West of Mund Road	West	11/06/07	1575	7:30	208	15:15	177	11/09/07	2504
Deer Park Road	07	East of Mund Road	East	11/07/07	2039	7:30	228	15:15	216	11/09/07	2406
Deer Park Road	07	East of Mund Road	West	11/07/07	2242	8:00	162	16:45	267	11/09/07	2603
Deer Park Road	08	West of Sunnyside Road	East	11/06/07	2260	8:00	163	16:45	263	11/09/07	2579
Deer Park Road	08	West of Sunnyside Road	West	11/06/07	2103	7:30	237	15:15	223	11/09/07	2447
Deer Park Road	09	East of Sunnyside Road	East	11/06/07	2184	7:00	150	15:45	253	11/09/07	2516
Deer Park Road	09	East of Sunnyside Road	West	11/06/07	2030	6:30	234	14:15	212	11/09/07	2362
Deer Park Road	10	West of Oak Street	East								
Deer Park Road	10	West of Oak Street	West								
Deer Park Road	11	East of Oak Street	East								
Deer Park Road	11	East of Oak Street	West								
Deer Park Road	12	West of Gist Road	East								
Deer Park Road	12	West of Gist Road	West								
Deer Park Road	13	East of Gist Road	East								
Deer Park Road	13	East of Gist Road	West								
Deer Park Road	14	West of Upper Sanitarium Road	East	08/13/07	467	6:15	44	13:15	52	08/13/07	2157
Deer Park Road	14	West of Upper Sanitarium Road	West	08/13/07	586	7:15	70	15:00	73	08/13/07	1970
Deer Park Road	15	East of Upper Sanitarium Road	East	08/13/07	2707	6:30	166	16:45	301	08/15/07	3190
Deer Park Road	15	East of Upper Sanitarium Road	West	08/13/07	2845	7:30	325	15:00	274	08/15/07	3314
Deer Park Road	16	West of Howell Mountain Road / White Cottage Road	East	08/13/07	2794	6:30	159	17:15	308	08/15/07	3123
Deer Park Road	16	West of Howell Mountain Road / White Cottage Road	West	08/13/07	2876	7:15	317	14:45	262	08/15/07	3181
Devlin Road	N/A	South of Soscol Ferry Road	North	09/30/04	262	10:30	35	15:45	45	10/06/04	358
Devlin Road	N/A	South of Soscol Ferry Road	South	09/30/04	237	5:00	37	12:00	26	10/06/04	308
Diamond Mountain Road	01	West of State Highway 29/128	East	05/03/05	235	8:45	24	16:15	26	05/03/05	311

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Diamond Mountain Road	01	West of State Highway 29/128	West	05/03/05	228	8:30	26	12:45	20	05/03/05	310
Diamond Mountain Road	02	East of Pachateau Road	East	05/03/05	75	10:45	8	13:30	9	05/06/05	91
Diamond Mountain Road	02	East of Pachateau Road	West	05/03/05	75	5:15	8	14:15	7	05/06/05	91
Diamond Mountain Road	03	West of Pachateau Road	East	05/03/05	56	9:15	7	13:30	8	05/06/05	73
Diamond Mountain Road	03	West of Pachateau Road	West	05/03/05	56	5:15	7	15:30	6	05/06/05	73
Diamond Mountain Road	04	East of South Fork Diamond Mountain Road	East	05/03/05	44	9:00	5	13:30	4	05/06/05	53
Diamond Mountain Road	04	East of South Fork Diamond Mountain Road	West	05/03/05	43	10:00	5	15:30	5	05/06/05	51
Diamond Mountain Road	05	West of South Fork Diamond Mountain Road	East	05/03/05	27	10:15	4	12:15	3	05/05/05	34
Diamond Mountain Road	05	West of South Fork Diamond Mountain Road	West	05/03/05	27	6:00	4	16:45	4	05/05/05	32
Dry Creek Road	01	Napa City Limits	North								
Dry Creek Road	01	Napa City Limits	South								
Dry Creek Road	02	South of Linda Vista Avenue	North								
Dry Creek Road	02	South of Linda Vista Avenue	South								
Dry Creek Road	03	North of Linda Vista Avenue	North								
Dry Creek Road	03	North of Linda Vista Avenue	South								
Dry Creek Road	04	South of Orchard Avenue	North								
Dry Creek Road	04	South of Orchard Avenue	South								
Dry Creek Road	05	North of Orchard Avenue	North								
Dry Creek Road	05	North of Orchard Avenue	South								
Dry Creek Road	06	South of Oakville Grade	North	06/08/05	106	5:30	14	16:00	9	06/11/05	112
Dry Creek Road	06	South of Oakville Grade	South	06/08/05	108	10:00	7	15:15	16	06/11/05	128
Dry Creek Road	07	North of Oakville Grade	North	06/08/05	414	11:00	22	16:30	47	06/10/05	541
Dry Creek Road	07	North of Oakville Grade	South	06/08/05	507	7:15	48	15:15	46	06/10/05	567
Dry Creek Road	08	South of Mt. Veeder Road	North								
Dry Creek Road	08	South of Mt. Veeder Road	South								
Dry Creek Road	09	North of Mt. Veeder Road	North	06/08/05	427	11:00	26	15:30	57	06/10/05	454
Dry Creek Road	09	North of Mt. Veeder Road	South	06/08/05	421	6:15	41	14:30	38	06/10/05	473
Dry Creek Road	10	South of Wall Road	North	06/08/05	387	7:00	20	16:45	53	06/10/05	425
Dry Creek Road	10	South of Wall Road	South	06/08/05	383	7:15	39	15:15	35	06/10/05	455
Dry Creek Road	11	North of Wall Road	North	06/08/05	369	11:00	21	14:30	52	06/10/05	403
Dry Creek Road	11	North of Wall Road	South	06/08/05	364	6:30	33	14:30	29	06/10/05	441
Dry Creek Road	12	Napa / Sonoma County Line	North	06/08/05	367	11:00	22	15:30	53	06/10/05	407
Dry Creek Road	12	Napa / Sonoma County Line	South	06/08/05	363	6:15	33	14:30	30	06/10/05	439
Dunaweal Lane	01	East of State Highway 29/128	East	03/13/03	732	6:15	57	15:15	73	03/14/03	881
Dunaweal Lane	01	East of State Highway 29/128	West	03/13/03	751	6:30	49	15:30	105	03/14/03	919
Dunaweal Lane	02	West of Silverado Trail	East	03/13/03	502	11:00	32	15:30	72	03/14/03	588
Dunaweal Lane	02	West of Silverado Trail	West	03/13/03	520	6:30	58	15:15	56	03/14/03	616
Dwyer Road	N/A	West of State Highway 29	East	03/04/05	68	11:00	8	15:45	12	03/07/05	101
Dwyer Road	N/A	West of State Highway 29	West	03/04/05	70	6:00	12	12:45	7	03/07/05	103
Ehlers Lane	N/A	East of State Highway 29/128	East	04/04/03	173	7:15	16	14:15	18	04/07/03	204
Ehlers Lane	N/A	East of State Highway 29/128	West	04/04/03	174	10:45	17	14:30	21	04/07/03	205
El Centro Avenue	01	Napa City Limits	East	07/31/07	1195	7:15	91	17:00	98	08/03/07	1344
El Centro Avenue	01	Napa City Limits	West	07/31/07	1441	11:00	83	16:30	215	08/03/07	1644
El Centro Avenue	01	Napa City Limits	East	07/23/09	1208	7:30	86	16:45	104	07/27/09	1331
El Centro Avenue	01	Napa City Limits	West	07/23/09	1472	11:00	83	16:30	223	07/27/09	1649
El Centro Avenue	02	West of Big Ranch Road	East	07/31/07	1097	7:30	91	17:15	89	08/03/07	1233
El Centro Avenue	02	West of Big Ranch Road	West	07/31/07	1355	11:00	79	16:45	213	08/03/07	1557
El Centro Avenue	02	West of Big Ranch Road	East	07/23/09	1132	7:30	91	16:30	92	07/24/09	1246
El Centro Avenue	02	West of Big Ranch Road	West	07/23/09	1417	11:00	76	16:30	228	07/24/09	1582
Executive Way	N/A	West of Kelly Road North	East	04/01/05	269	10:45	48	15:15	62	04/06/05	369
Executive Way	N/A	West of Kelly Road North	West	04/01/05	269	6:30	63	12:00	32	04/06/05	372
Fawn Park Road	N/A	East of Silverado Trail	East	04/04/03	98	8:30	8	12:30	12	04/07/03	125
Fawn Park Road	N/A	East of Silverado Trail	West	04/04/03	89	6:45	11	15:45	9	04/07/03	127
Finnell Road	01	Yountville Town Limit	North	07/17/08	179	5:30	19	15:15	18	07/18/08	211
Finnell Road	01	Yountville Town Limit	South	07/17/08	153	7:00	12	17:00	20	07/18/08	173
Finnell Road	02	South of Yountville Crossroad	North	07/17/08	180	8:15	19	15:30	21	07/18/08	218

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Finnell Road	02	South of Yountville Crossroad	South	07/17/08	152	11:00	14	15:45	19	07/18/08	178
Foster Road	01	North of Golden Gate Drive	North	07/11/03	263	10:30	14	16:30	28	07/11/03	439
Foster Road	01	North of Golden Gate Drive	South	07/11/03	234	6:15	17	12:45	18	07/11/03	381
Foster Road	02	Napa City Limits	North								
Foster Road	02	Napa City Limits	South								
Franz Valley School Road	01	Napa / Sonoma County Line	East	04/20/06	146	7:30	20	12:00	13	04/21/06	174
Franz Valley School Road	01	Napa / Sonoma County Line	West	04/20/06	155	10:30	11	17:30	17	04/21/06	172
Franz Valley School Road	02	West of Shaw-Williams Road	East	04/20/06	218	7:00	25	15:30	23	04/21/06	257
Franz Valley School Road	02	West of Shaw-Williams Road	West	04/20/06	228	6:15	19	16:00	24	04/21/06	262
Franz Valley School Road	03	East of Shaw-Williams Road	East	04/20/06	241	7:00	26	15:45	24	04/21/06	289
Franz Valley School Road	03	East of Shaw-Williams Road	West	04/20/06	248	6:15	21	15:30	25	04/21/06	288
Franz Valley School Road	04	West of Petrified Forest Road	East	04/20/06	268	6:00	22	15:30	27	04/21/06	303
Franz Valley School Road	04	West of Petrified Forest Road	West	04/20/06	257	7:00	27	15:45	25	04/21/06	301
Galleron Lane	N/A	West of State Highway 29/128	East	03/04/05	236	8:15	30	14:45	19	03/08/05	290
Galleron Lane	N/A	West of State Highway 29/128	West	03/04/05	243	9:15	23	16:30	45	03/08/05	302
Glass Mountain Road	01	East of Silverado Trail	East	03/25/03	476	7:30	48	16:30	42	03/31/03	568
Glass Mountain Road	01	East of Silverado Trail	West	03/25/03	504	7:30	47	15:00	60	03/31/03	611
Glass Mountain Road	02	West of Sanitarium Road	East								
Glass Mountain Road	02	West of Sanitarium Road	West								
Golden Gate Drive	01	North of Foster Road	North	07/10/03	401	7:30	23	16:15	62	07/15/03	424
Golden Gate Drive	01	North of Foster Road	South	07/10/03	243	6:15	20	15:00	19	07/15/03	271
Golden Gate Drive	02	Napa City Limits	North								
Golden Gate Drive	02	Napa City Limits	South								
Gordon Valley Road	01	Napa/Solano County Line	North	05/02/08	229	8:00	13	16:00	22	05/02/08	257
Gordon Valley Road	01	Napa/Solano County Line	South	05/02/08	222	7:15	20	15:45	27	05/02/08	249
Gordon Valley Road	02	South of Wooden Valley Crossroad	North	05/02/08	176	11:00	9	15:00	16	05/03/08	220
Gordon Valley Road	02	South of Wooden Valley Crossroad	South	05/02/08	167	7:15	14	15:45	16	05/03/08	207
Gordon Valley Road	03	North of Wooden Valley Crossroad	North	05/02/08	149	10:15	9	16:00	16	05/03/08	177
Gordon Valley Road	03	North of Wooden Valley Crossroad	South	05/02/08	147	7:15	20	15:45	12	05/03/08	178
Green Island Road	N/A	American Canyon City Limit	East	03/04/04	300	8:15	23	16:00	50	03/05/04	375
Green Island Road	N/A	American Canyon City Limit	West	03/04/04	303	7:30	42	12:45	29	03/05/04	371
Greenwood Road - North	N/A	West of Kelly Road South	East	04/08/04	17	9:45	4	12:00	2	04/08/04	31
Greenwood Road - North	N/A	West of Kelly Road South	West	04/08/04	58	7:45	24	13:00	5	04/08/04	105
Greenwood Road - South	N/A	West of Kelly Road South	East	04/08/04	207	11:00	17	16:45	78	04/14/04	276
Greenwood Road - South	N/A	West of Kelly Road South	West	04/08/04	164	7:45	63	12:30	20	04/14/04	239
Hagen Road	01	Napa City Limits	East								
Hagen Road	01	Napa City Limits	West								
Hagen Road	02	West of First Avenue	East								
Hagen Road	02	West of First Avenue	West								
Hagen Road	03	East of First Avenue	East								
Hagen Road	03	East of First Avenue	West								
Hagen Road	04	West of Vichy Avenue	East	11/15/08	1783	9:00	196	16:15	181	11/21/08	2083
Hagen Road	04	West of Vichy Avenue	West	11/15/08	1759	8:45	220	15:15	212	11/21/08	1980
Hagen Road	05	East of Vichy Avenue	East	11/15/08	1360	9:15	121	15:45	119	11/20/08	1537
Hagen Road	05	East of Vichy Avenue	West	11/15/08	1337	8:30	132	17:30	148	11/20/08	1500
Hagen Road	06	West of Loma Heights Road	East								
Hagen Road	06	West of Loma Heights Road	West								
Hagen Road	07	East of Loma Heights Road	East								
Hagen Road	07	East of Loma Heights Road	West								
Hagen Road	08	West of La Londe Lane	East								
Hagen Road	08	West of La Londe Lane	West								
Hagen Road	09	East of La Londe Lane	East								
Hagen Road	09	East of La Londe Lane	West								
Hagen Road	10	West of Olive Hill Lane (West)	East								
Hagen Road	10	West of Olive Hill Lane (West)	West								
Hagen Road	11	East of Olive Hill Lane (West)	East								

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Hagen Road	11	East of Olive Hill Lane (West)	West								
Hagen Road	12	West of Olive Hill Lane (East)	East								
Hagen Road	12	West of Olive Hill Lane (East)	West								
Hagen Road	13	East of Olive Hill Lane (East)	East								
Hagen Road	13	East of Olive Hill Lane (East)	West								
Hagen Road	14	West of Third Avenue	East								
Hagen Road	14	West of Third Avenue	West								
Hagen Road	15	East of Third Avenue	East								
Hagen Road	15	East of Third Avenue	West								
Hardin Road	N/A	South of Pope Canyon Road	North	05/19/04	72	7:30	7	14:45	20	05/19/04	160
Hardin Road	N/A	South of Pope Canyon Road	South	05/19/04	68	5:00	21	15:00	6	05/19/04	147
Hoffman Lane	N/A	West of Solano Avenue	East								
Hoffman Lane	N/A	West of Solano Avenue	West								
Howard Lane	N/A	East of State Highway 29	North	02/19/03	50	11:00	5	14:30	7	02/21/03	64
Howard Lane	N/A	East of State Highway 29	South	02/19/03	49	9:00	7	13:45	5	02/21/03	70
Howell Mountain Road	01	East of Silverado Trail	East	05/07/03	1047	7:30	101	15:45	85	05/09/03	1196
Howell Mountain Road	01	East of Silverado Trail	West	05/07/03	1046	10:15	76	14:30	122	05/09/03	1168
Imola Avenue	01		East								
Imola Avenue	01		West								
Imola Avenue	02		East								
Imola Avenue	02		West								
Imola Avenue	03		East								
Imola Avenue	03		West								
Imola Avenue	04		East								
Imola Avenue	04		West								
Imola Avenue	05		East								
Imola Avenue	05		West								
Imola Avenue	06	East of Shurtleff Avenue	East	02/03/05	2155	8:00	172	17:00	209	02/09/05	2390
Imola Avenue	06	East of Shurtleff Avenue	West	02/03/05	2120	7:30	241	14:15	180	02/09/05	2458
Imola Avenue	07	West of Tejas Avenue	East	02/03/05	2142	8:00	172	17:00	205	02/09/05	2380
Imola Avenue	07	West of Tejas Avenue	West	02/03/05	2088	7:30	232	14:15	180	02/09/05	2420
Imola Avenue	08	East of Tejas Avenue	East	02/03/05	1873	8:15	162	17:00	179	02/09/05	2074
Imola Avenue	08	East of Tejas Avenue	West	02/03/05	1850	7:30	204	14:30	163	02/09/05	2160
Imola Avenue	09	West of Penny Lane	East	02/03/05	977	7:15	67	17:00	104	02/09/05	1051
Imola Avenue	09	West of Penny Lane	West	02/03/05	951	7:30	118	15:45	88	02/09/05	1076
Imola Avenue	10	East of Penny Lane	East	02/03/05	855	7:15	62	17:00	93	02/09/05	915
Imola Avenue	10	East of Penny Lane	West	02/03/05	822	7:30	108	15:45	79	02/09/05	931
Imola Avenue	11	West of Fourth Avenue	East	02/03/05	836	7:15	62	17:00	90	02/09/05	905
Imola Avenue	11	West of Fourth Avenue	West	02/03/05	792	7:30	108	15:45	75	02/09/05	911
Ink Grade	01										
Ink Grade	01										
Ink Grade	02										
Ink Grade	02										
Ink Grade	03										
Ink Grade	03										
Ink Grade	04	West of Pope Valley Road	East	07/21/04	27	7:00	2	15:45	4	07/27/04	41
Ink Grade	04	West of Pope Valley Road	West	07/21/04	30	4:00	3	14:45	4	07/27/04	37
James Creek Road	N/A	West of Butts Canyon Road	East	04/20/07	1	8:45	0	12:00	0	04/22/07	0
James Creek Road	N/A	West of Butts Canyon Road	West	04/20/07	6	8:45	1	13:15	0	04/22/07	23
Kelly Road North	01	South of Executive Way	North	04/01/05	8787	6:15	1047	14:45	763	04/01/05	10139
Kelly Road North	01	South of Executive Way	South	04/01/05	439	11:00	59	15:15	81	04/01/05	555
Kelly Road North	02	North of Executive Way	North	04/01/05	8681	6:15	1005	14:45	786	04/01/05	10037
Kelly Road North	02	North of Executive Way	South	04/01/05	297	11:00	33	15:15	50	04/01/05	391
Kelly Road North	03	South of Camino Oruga	North	04/07/05	8647	6:15	1095	14:45	775	04/07/05	9659
Kelly Road North	03	South of Camino Oruga	South	04/07/05	252	10:45	33	14:30	48	04/07/05	418
Kelly Road North	04	North of Camino Oruga	North	04/01/05	8598	6:15	961	15:30	808	04/01/05	9931

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Kelly Road North	04	North of Camino Oruga	South	04/01/05	202	6:15	34	14:30	30	04/01/05	264
Kelly Road North	05	South of State Highway 29	North	04/01/05	8589	6:15	972	15:30	817	04/01/05	9916
Kelly Road North	05	South of State Highway 29	South	04/01/05	169	6:30	37	14:45	19	04/01/05	222
Kelly Road South	01										
Kelly Road South	01										
Kelly Road South	02										
Kelly Road South	02										
Kelly Road South	03	North of State Highway 29	North	04/08/04	2696	6:15	659	14:45	365	04/11/04	2066
Kelly Road South	03	North of State Highway 29	South	04/08/04	1035	10:45	80	15:30	101	04/11/04	2670
Kelly Road South	04	South of Café Court	North	04/08/04	2666	7:00	658	15:45	375	04/11/04	1924
Kelly Road South	04	South of Café Court	South	04/08/04	1041	11:00	64	16:15	98	04/11/04	2726
Kelly Road South	05	North of Café Court	North	04/08/04	2341	6:15	514	14:45	385	04/08/04	3337
Kelly Road South	05	North of Café Court	South	04/08/04	693	11:00	72	15:30	99	04/08/04	868
Kelly Road South	06	South of Greenwood Road - South	North	04/08/04	2709	6:00	605	14:45	391	04/11/04	2557
Kelly Road South	06	South of Greenwood Road - South	South	04/08/04	828	10:30	72	15:15	90	04/11/04	1690
Kelly Road South	07	North of Greenwood Road - South	North	04/08/04	2770	6:15	563	14:45	420	04/11/04	2557
Kelly Road South	07	North of Greenwood Road - South	South	04/08/04	877	7:00	85	15:30	71	04/11/04	1719
Kelly Road South	08	South of Greenwood Road - North	North	04/08/04	2719	6:15	523	14:45	409	04/11/04	2554
Kelly Road South	08	South of Greenwood Road - North	South	04/08/04	881	7:00	82	15:30	70	04/11/04	1715
Kelly Road South	09	South of State Highway 12	North	04/08/04	2650	6:15	455	14:45	402	04/11/04	2554
Kelly Road South	09	South of State Highway 12	South	04/08/04	925	6:45	106	15:30	72	04/11/04	1696
Kirkland Ranch Road	01	East of State Highway 12	East	02/07/07							
Kirkland Ranch Road	01	East of State Highway 12	West	02/07/07							
Kirkland Ranch Road	02	West of Polson Road	East	02/07/07	90	7:30	1	16:30	52	02/12/07	158
Kirkland Ranch Road	02	West of Polson Road	West	02/07/07	26	6:15	6	12:00	2	02/12/07	28
Kirkland Ranch Road	03	East of Polson Road	East	02/07/07	82	11:00	2	16:30	51	02/12/07	150
Kirkland Ranch Road	03	East of Polson Road	West	02/07/07	17	6:15	5	12:00	2	02/12/07	17
Kirkland Ranch Road	04	West of Highway 12	East	02/07/07	82	11:00	1	16:30	50	02/12/07	151
Kirkland Ranch Road	04	West of Highway 12	West	02/07/07	16	6:15	5	12:00	2	02/12/07	16
Kortum Canyon Road	N/A	Calistoga City Limit	East	04/20/05	90	9:15	10	15:15	9	04/21/05	105
Kortum Canyon Road	N/A	Calistoga City Limit	West	04/20/05	97	10:15	9	16:15	11	04/21/05	115
La Grande Avenue	N/A	East of Vichy Avenue	East	11/15/08	232	9:30	15	15:45	27	11/19/08	258
La Grande Avenue	N/A	East of Vichy Avenue	West	11/15/08	231	8:30	32	15:45	22	11/19/08	259
Langtry Road	N/A	South of Spring Mountain Road	North	03/29/06	50	10:45	5	15:30	12	03/31/06	64
Langtry Road	N/A	South of Spring Mountain Road	South	03/29/06	52	6:00	13	12:00	4	03/31/06	67
Larkmead Lane	01	East of State Highway 29/128	East	03/13/03	255	6:00	60	12:45	25	03/19/03	314
Larkmead Lane	01	East of State Highway 29/128	West	03/13/03	229	11:00	20	15:30	37	03/19/03	276
Larkmead Lane	02	West of Silverado Trail	East	03/13/03	223	6:00	39	15:30	23	03/18/03	260
Larkmead Lane	02	West of Silverado Trail	West	03/13/03	203	6:45	19	15:30	25	03/18/03	249
Las Posadas Road	N/A	East of Cold Springs Road	East	01/28/03	122	10:45	10	16:45	11	01/29/03	144
Las Posadas Road	N/A	East of Cold Springs Road	West	01/28/03	124	8:00	14	15:45	13	01/29/03	145
Livermore Road	N/A	East of State Highway 29	East	04/20/05	19	7:00	4	12:15	2	04/20/05	28
Livermore Road	N/A	East of State Highway 29	West	04/20/05	19	6:45	2	15:00	5	04/20/05	30
Lodi Lane	01	East of State Highway 29/128	East	03/25/03	363	7:15	38	16:30	31	03/26/03	405
Lodi Lane	01	East of State Highway 29/128	West	03/25/03	328	7:15	27	15:00	44	03/26/03	383
Lodi Lane	02	West of Silverado Trail	East	03/25/03	359	6:15	38	16:45	29	03/26/03	404
Lodi Lane	02	West of Silverado Trail	West	03/25/03	323	7:15	28	15:00	46	03/26/03	365
Lokoya Road	N/A	West of Mt.Veeder Road	East	06/22/05	44	5:15	8	14:30	7	06/28/05	103
Lokoya Road	N/A	West of Mt.Veeder Road	West	06/22/05	65	6:15	6	15:15	10	06/28/05	99
Lommel Road	N/A	East of Silverado Trail	East	03/13/03	175	6:00	60	12:15	20	03/19/03	246
Lommel Road	N/A	East of Silverado Trail	West	03/13/03	176	11:00	19	14:45	39	03/19/03	250
Lovall Valley Loop Road	01	East of Lovall Valley Road - North	East	04/13/04	55	11:00	4	17:00	6	04/17/04	63
Lovall Valley Loop Road	01	East of Lovall Valley Road - North	West	04/13/04	68	7:45	8	14:00	6	04/17/04	79
Lovall Valley Loop Road	02	East of Lovall Valley Road - South	East	04/13/04	55	7:30	5	16:30	6	04/16/04	68
Lovall Valley Loop Road	02	East of Lovall Valley Road - South	West	04/13/04	43	7:15	5	15:30	6	04/16/04	56
Lovall Valley Loop Road	03	East of Lovall Valley Road - South	East	04/21/04	25	10:15	3	14:30	4	04/27/04	29

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Lovall Valley Loop Road	03	East of Lovall Valley Road - South	West	04/21/04	26	5:45	3	14:15	2	04/27/04	33
Lovall Valley Road	01	Napa / Sonoma County Line	North	04/13/04	135	6:45	14	14:30	13	04/15/04	158
Lovall Valley Road	01	Napa / Sonoma County Line	South	04/13/04	136	9:30	11	15:45	13	04/15/04	159
Lovall Valley Road	02	North of Lovall Valley Loop Road	North	04/13/04	133	6:45	14	14:30	13	04/15/04	154
Lovall Valley Road	02	North of Lovall Valley Loop Road	South	04/13/04	131	9:30	10	12:45	12	04/15/04	150
Lovall Valley Road	03	South of Lovall Valley Loop Road	North	04/13/04	70	11:00	9	15:00	9	04/15/04	88
Lovall Valley Road	03	South of Lovall Valley Loop Road	South	04/13/04	82	9:30	8	15:15	7	04/15/04	91
Lovall Valley Road	04	North of Lovall Valley Loop Road - South	North	04/13/04	55	10:45	7	14:30	8	04/15/04	71
Lovall Valley Road	04	North of Lovall Valley Loop Road - South	South	04/13/04	67	6:30	7	14:30	6	04/15/04	75
Lower Chiles Valley Road	01	North of State Highway 128	North	06/20/07	153	5:15	20	16:45	18	06/20/07	188
Lower Chiles Valley Road	01	North of State Highway 128	South	06/20/07	151	4:45	11	15:30	24	06/20/07	168
Lower Chiles Valley Road	02	South of Chiles-Pope Valley Road	North	06/20/07	132	5:15	15	17:00	13	06/20/07	169
Lower Chiles Valley Road	02	South of Chiles-Pope Valley Road	South	06/20/07	132	7:00	10	15:00	19	06/20/07	142
Manley Lane	N/A	West of State Highway 29	East	03/04/05	97	8:00	11	15:00	17	03/07/05	119
Manley Lane	N/A	West of State Highway 29	West	03/04/05	98	6:15	15	12:15	12	03/07/05	112
Maple Lane	N/A	East of State Highway 29/128	East	04/20/05	171	6:00	42	16:30	18	04/21/05	242
Maple Lane	N/A	East of State Highway 29/128	West	04/20/05	113	7:00	16	15:30	20	04/21/05	154
Meadowood Lane	N/A	North of Howell Mountain Road	North	04/22/03	616	7:00	62	13:00	50	04/25/03	705
Meadowood Lane	N/A	North of Howell Mountain Road	South	04/22/03	605	10:30	57	13:30	62	04/25/03	686
Mee Lane	N/A	East of State Highway 29/128	East	03/04/05	130	8:45	18	12:00	13	03/09/05	148
Mee Lane	N/A	East of State Highway 29/128	West	03/04/05	127	10:45	15	16:15	15	03/09/05	150
Money Road	N/A	North of Oakville Crossroad	North	08/13/08	158	8:30	17	14:30	21	08/16/08	194
Money Road	N/A	North of Oakville Crossroad	South	08/13/08	155	8:30	15	12:30	16	08/16/08	204
Mt. Veeder Road	01	North of Redwood Road	North	06/22/05	331	5:30	34	15:45	28	06/24/05	379
Mt. Veeder Road	01	North of Redwood Road	South	06/22/05	317	7:15	25	15:30	45	06/24/05	358
Mt. Veeder Road	02	South of Lokoya Road	North	06/22/05	208	10:45	14	15:45	25	06/24/05	235
Mt. Veeder Road	02	South of Lokoya Road	South	06/22/05	196	6:45	19	15:45	21	06/24/05	207
Mt. Veeder Road	03	North of Lokoya Road	North	06/22/05	157	11:00	11	15:45	20	06/24/05	182
Mt. Veeder Road	03	North of Lokoya Road	South	06/22/05	146	7:30	14	16:30	17	06/24/05	158
Mt. Veeder Road	04	South of Dry Creek Road	North	06/07/05	141	10:45	12	15:45	15	06/11/05	165
Mt. Veeder Road	04	South of Dry Creek Road	South	06/07/05	132	6:00	11	15:00	11	06/11/05	173
Mulford Drive	N/A	West of Berryessa-Knoxville Road	East	04/28/04	36	6:15	5	12:15	4	04/29/04	41
Mulford Drive	N/A	West of Berryessa-Knoxville Road	West	04/28/04	36	10:00	3	16:45	5	04/29/04	43
Mund Road	01	South of Deer Park Road	North	11/06/07	66	7:45	10	16:00	8	11/08/07	83
Mund Road	01	South of Deer Park Road	South	11/06/07	69	6:30	7	16:15	10	11/08/07	83
Mund Road	02	South of Sunnyside Road	North	11/06/07	128	7:15	12	16:30	16	11/12/07	165
Mund Road	02	South of Sunnyside Road	South	11/06/07	128	8:15	16	18:45	15	11/12/07	162
Niebaum Lane	N/A	West of State Highway 29/128	East	03/04/05	108	7:15	9	14:45	20	03/07/05	216
Niebaum Lane	N/A	West of State Highway 29/128	West	03/04/05	109	6:00	17	14:00	10	03/07/05	213
Oak Knoll Avenue	01	East of State Highway 29	East	07/31/07	1939	7:30	153	15:30	183	08/03/07	2284
Oak Knoll Avenue	01	East of State Highway 29	West	07/31/07	2071	7:30	152	16:30	261	08/03/07	2329
Oak Knoll Avenue	01	East of State Highway 29	East	07/09/09	1930	7:45	147	15:15	187	07/15/09	2194
Oak Knoll Avenue	01	East of State Highway 29	West	07/09/09	1956	7:45	140	16:30	233	07/15/09	2171
Oak Knoll Avenue	02	West of Big Ranch Road	East	07/31/07	1870	7:30	144	15:30	191	08/03/07	2211
Oak Knoll Avenue	02	West of Big Ranch Road	West	07/31/07	1999	7:15	157	16:30	250	08/03/07	2253
Oak Knoll Avenue	02	West of Big Ranch Road	East	07/23/09	1796	7:45	138	15:15	182	07/24/09	2107
Oak Knoll Avenue	02	West of Big Ranch Road	West	07/23/09	1867	7:15	149	16:30	228	07/24/09	2097
Oak Knoll Avenue	03	East of Big Ranch Road	East	07/31/07	1657	7:30	181	14:45	119	08/03/07	1971
Oak Knoll Avenue	03	East of Big Ranch Road	West	07/31/07	2181	11:00	105	16:30	458	08/03/07	2557
Oak Knoll Avenue	03	East of Big Ranch Road	East	07/23/09	1585	7:30	161	13:30	113	07/24/09	1871
Oak Knoll Avenue	03	East of Big Ranch Road	West	07/23/09	2015	11:00	101	16:30	405	07/24/09	2292
Oak Street	N/A	East of Deer Park Road	East	12/04/03	62	8:30	5	16:00	7	12/10/03	74
Oak Street	N/A	East of Deer Park Road	West	12/04/03	69	8:30	9	12:15	7	12/10/03	89
Oakville Crossroad	01	East of State Highway 29	East	08/13/08	1121	6:00	106	14:30	107	08/15/08	1365
Oakville Crossroad	01	East of State Highway 29	West	08/13/08	940	11:00	81	15:15	124	08/15/08	1109
Oakville Crossroad	02	West of Money Road	East	08/13/08	955	9:45	74	15:15	102	08/15/08	1160

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Oakville Crossroad	02	West of Money Road	West	08/13/08	815	11:00	73	14:45	103	08/15/08	945
Oakville Crossroad	03	East of Money Road	East	08/13/08	844	10:00	64	15:00	112	08/15/08	1030
Oakville Crossroad	03	East of Money Road	West	08/13/08	706	11:00	59	15:00	89	08/15/08	823
Oakville Crossroad	04	West of Silverado Trail	East	08/13/08	840	11:00	61	15:00	135	08/15/08	1031
Oakville Crossroad	04	West of Silverado Trail	West	08/13/08	724	7:45	67	15:00	73	08/15/08	837
Oakville Grade	01	West of State Highway 29	East	06/08/05	813	11:00	65	16:00	909	06/10/05	892
Oakville Grade	01	West of State Highway 29	West	06/08/05	798	7:00	72	15:15	75	06/10/05	882
Oakville Grade	02	East of Dry Creek Road	East	06/08/05	471	7:15	47	14:00	38	06/10/05	520
Oakville Grade	02	East of Dry Creek Road	West	06/08/05	468	11:00	26	16:45	59	06/10/05	507
Old Lawley Toll Road	01	East of State Highway 29	East	04/20/05	126	7:30	13	12:15	13	04/22/05	145
Old Lawley Toll Road	01	East of State Highway 29	West	04/20/05	120	7:45	13	15:45	15	04/22/05	140
Old Lawley Toll Road	02	West of State Highway 29	East	04/20/05	13	9:45	1	13:15	2	04/20/05	19
Old Lawley Toll Road	02	West of State Highway 29	West	04/20/05	9	10:15	1	14:45	1	04/20/05	6
Old Sonoma Road	01	East of State Highway 12/121	East								
Old Sonoma Road	01	East of State Highway 12/121	West								
Old Sonoma Road	02	West of Old Sonoma Highway	East								
Old Sonoma Road	02	West of Old Sonoma Highway	West								
Old Sonoma Road	03	East of Old Sonoma Highway	East								
Old Sonoma Road	03	East of Old Sonoma Highway	West								
Old Sonoma Road	04	West of Dealy Lane	East								
Old Sonoma Road	04	West of Dealy Lane	West								
Old Sonoma Road	05	East of Dealy Lane	East	07/11/03	2024	7:30	112	16:45	266	07/17/03	2241
Old Sonoma Road	05	East of Dealy Lane	West	07/11/03	1693	6:15	180	16:45	122	07/17/03	1864
Old Sonoma Road	06	West of Buhman Avenue	East								
Old Sonoma Road	06	West of Buhman Avenue	West								
Old Sonoma Road	07	East of Buhman Avenue	East								
Old Sonoma Road	07	East of Buhman Avenue	West								
Old Sonoma Road	08	West of Congress Valley Road	East								
Old Sonoma Road	08	West of Congress Valley Road	West								
Old Sonoma Road	09	East of Congress Valley Road	East								
Old Sonoma Road	09	East of Congress Valley Road	West								
Old Sonoma Road	10	Napa City Limits	East								
Old Sonoma Road	10	Napa City Limits	West								
Pachateau Road	N/A	North of Diamond Mountain Road	North	05/03/05	21	7:30	3	14:15	3	05/03/05	26
Pachateau Road	N/A	North of Diamond Mountain Road	South	05/03/05	21	7:45	3	14:45	3	05/03/05	25
Palisades Road	N/A	East of State Highway 29	East	04/20/05	45	9:30	5	12:15	6	04/26/05	67
Palisades Road	N/A	East of State Highway 29	West	04/20/05	42	8:00	5	15:15	5	04/26/05	56
Partrick Road	N/A	Napa City Limits	East	03/04/04	210	7:45	20	16:15	23	03/09/04	244
Partrick Road	N/A	Napa City Limits	West	03/04/04	209	8:45	17	13:15	19	03/09/04	237
Penny Lane	N/A	North of Imola Avenue	North	02/03/05	147	11:00	9	15:45	16	02/03/05	168
Penny Lane	N/A	North of Imola Avenue	South	02/03/05	147	7:00	13	15:30	13	02/03/05	171
Petrified Forest Road	01	Napa/ Sonoma County Line	East	04/20/06	4828	6:30	373	16:00	485	04/21/06	5512
Petrified Forest Road	01	Napa/ Sonoma County Line	West	04/20/06	4824	5:45	410	15:00	403	04/21/06	5207
Petrified Forest Road	02	West of Franz Valley School Road	East	04/20/06	4808	6:30	361	15:45	484	04/21/06	5512
Petrified Forest Road	02	West of Franz Valley School Road	West	04/20/06	4975	5:30	431	15:15	428	04/21/06	5362
Petrified Forest Road	03	East of Franz Valley School Road	East	04/20/06	4982	6:30	400	15:45	484	04/21/06	5706
Petrified Forest Road	03	East of Franz Valley School Road	West	04/20/06	5220	5:30	435	15:15	451	04/21/06	5639
Petrified Forest Road	04	Calistoga City Limit Line	East	04/20/06	4753	7:30	389	17:15	465	04/21/06	5351
Petrified Forest Road	04	Calistoga City Limit Line	West	04/20/06	5376	6:45	446	16:30	471	04/21/06	5846
Pickett Road	01	East of Silverado Trail	East	03/04/03	91	10:15	11	14:30	10	03/05/03	128
Pickett Road	01	East of Silverado Trail	West	03/04/03	91	10:45	11	15:30	15	03/05/03	129
Pickett Road	02	West of Rosedale Road	East	03/13/03	92	10:30	9	15:15	17	03/17/03	122
Pickett Road	02	West of Rosedale Road	West	03/13/03	89	7:45	12	14:30	9	03/17/03	110
Pickett Road	03	East of Rosedale Road	East	03/13/03	113	6:30	15	14:30	13	03/17/03	147
Pickett Road	03	East of Rosedale Road	West	03/13/03	112	10:30	11	15:15	20	03/17/03	149
Pine Place	N/A	East of Oak Street	East	12/04/03	33	10:45	4	16:00	4	12/04/03	45

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Pine Place	N/A	East of Oak Street	West	12/04/03	34	8:00	4	12:45	3	12/04/03	41
Polson Road	N/A	North of Kirkland Ranch Road	North	02/07/07	13	8:00	1	17:15	2	02/13/07	19
Polson Road	N/A	North of Kirkland Ranch Road	South	02/07/07	13	7:15	2	15:30	2	02/13/07	18
Ponti Lane	N/A	North of Skellenger Lane	North	08/22/08	66	5:30	23	12:00	5	08/27/08	93
Ponti Lane	N/A	North of Skellenger Lane	South	08/22/08	66	10:15	16	13:45	11	08/27/08	100
Pope Canyon Road	01	East of Chiles-Pope Valley Road	East	06/20/07	104	5:15	12	16:15	9	06/22/07	135
Pope Canyon Road	01	East of Chiles-Pope Valley Road	West	06/20/07	111	6:15	11	14:45	11	06/22/07	124
Pope Canyon Road	02	West of Pope Valley Crossroad	East	05/19/04	100	4:00	15	16:30	7	05/22/04	122
Pope Canyon Road	02	West of Pope Valley Crossroad	West	05/19/04	113	5:45	10	14:00	22	05/22/04	143
Pope Canyon Road	03	East of Pope Valley Crossroad	East	05/19/04	358	5:00	46	14:30	27	05/21/04	432
Pope Canyon Road	03	East of Pope Valley Crossroad	West	05/19/04	375	7:30	32	15:15	57	05/21/04	404
Pope Canyon Road	04	West of Hardin Road	East	05/19/04	345	4:00	42	14:00	27	05/21/04	420
Pope Canyon Road	04	West of Hardin Road	West	05/19/04	364	6:30	32	14:15	52	05/21/04	391
Pope Canyon Road	05	East of Hardin Road	East	05/19/04	230	10:30	21	17:30	20	05/23/04	243
Pope Canyon Road	05	East of Hardin Road	West	05/19/04	255	7:30	23	15:15	23	05/23/04	391
Pope Canyon Road	06	West of Berryessa-Knoxville Road	East	04/28/04	196	7:45	9	14:45	19	05/02/04	307
Pope Canyon Road	06	West of Berryessa-Knoxville Road	West	04/28/04	191	6:45	16	15:00	15	05/02/04	330
Pope Street	N/A	West of Silverado Trail	East	04/23/03	2026	11:00	151	14:15	212	04/25/03	2276
Pope Street	N/A	West of Silverado Trail	West	04/23/03	2718	6:45	267	14:30	257	04/25/03	2949
Pope Valley Crossroad	01	East of Chiles-Pope Valley Road	East	06/30/07	272	5:00	34	13:15	21	06/30/07	318
Pope Valley Crossroad	01	East of Chiles-Pope Valley Road	West	06/30/07	270	11:00	19	15:45	31	06/30/07	292
Pope Valley Road	01	North of Howell Mountain Road	North	04/20/07	925	6:30	46	17:00	141	04/26/07	1071
Pope Valley Road	01	North of Howell Mountain Road	South	04/20/07	900	7:00	137	15:45	75	04/26/07	1027
Pope Valley Road	02	South of Ink Grade	North	05/09/07	962	8:30	42	16:00	146	05/11/07	1132
Pope Valley Road	02	South of Ink Grade	South	05/09/07	933	7:00	129	15:45	75	05/11/07	973
Pope Valley Road	03	North of Ink Grade	North	04/20/07	886	10:45	52	15:15	141	04/26/07	1040
Pope Valley Road	03	North of Ink Grade	South	04/20/07	863	5:45	140	14:30	68	04/26/07	990
Pope Valley Road	04	South of Aetna Springs	North	04/20/07	849	11:00	50	15:30	139	04/26/07	978
Pope Valley Road	04	South of Aetna Springs	South	04/20/07	809	5:15	135	14:30	62	04/26/07	914
Pratt Avenue	N/A	West of Silverado Trail	East	04/04/03	389	11:00	33	14:00	59	04/08/03	485
Pratt Avenue	N/A	West of Silverado Trail	West	04/04/03	396	6:45	44	14:00	40	04/08/03	446
Putah Creek Drive	N/A	East of Berryessa-Knoxville Road	East	04/29/04	114	9:15	7	16:45	14	05/01/04	155
Putah Creek Drive	N/A	East of Berryessa-Knoxville Road	West	04/29/04	119	6:00	17	12:00	6	05/01/04	159
Ragatz Lane	N/A	East of Washington Street	East	02/19/03	80	7:30	8	14:15	9	02/25/03	100
Ragatz Lane	N/A	East of Washington Street	West	02/19/03	81	8:30	11	16:15	11	02/25/03	102
Redwood Road	01	Napa City Limits	East	06/22/05	794	10:30	57	14:30	102	06/24/05	875
Redwood Road	01	Napa City Limits	West	06/22/05	807	6:30	62	13:30	64	06/24/05	896
Redwood Road	02	East of Mt. Veeder Road	East	06/22/05	606	8:15	40	15:30	89	06/24/05	678
Redwood Road	02	East of Mt. Veeder Road	West	06/22/05	615	7:30	55	14:30	49	06/24/05	699
Redwood Road	03	West of Mt. Veeder Road	East	06/22/05	336	10:30	30	14:30	47	06/24/05	399
Redwood Road	03	West of Mt. Veeder Road	West	06/22/05	337	6:30	44	13:30	34	06/24/05	407
Rose Drive	N/A	East of State Highway 121	East	03/08/05	149	10:00	11	16:30	17	03/11/05	159
Rose Drive	N/A	East of State Highway 121	West	03/08/05	150	7:30	21	14:15	13	03/11/05	167
Rosedale Road	01	North of Pickett Road	North	03/13/03	75	9:45	9	15:30	10	03/17/03	94
Rosedale Road	01	North of Pickett Road	South	03/13/03	73	7:15	8	14:30	11	03/17/03	95
Rosedale Road	02	South of Silverado Trail	North	03/04/03	117	10:00	9	15:15	12	03/07/03	133
Rosedale Road	02	South of Silverado Trail	South	03/04/03	116	10:30	11	15:15	14	03/07/03	130
Rosemont Circle	N/A	South of State Highway 121	North	03/08/05	29	7:30	4	12:45	3	03/14/05	36
Rosemont Circle	N/A	South of State Highway 121	South	03/08/05	29	8:15	3	12:30	3	03/14/05	37
Salvador Avenue	01	Napa City Limits	East	07/26/07	1397	7:45	123	15:15	107	07/27/07	1658
Salvador Avenue	01	Napa City Limits	West	07/26/07	1495	11:00	91	16:45	193	07/27/07	1702
Salvador Avenue	01	Napa City Limits	East	07/23/09	1331	7:30	103	15:30	108	07/24/09	1485
Salvador Avenue	01	Napa City Limits	West	07/23/09	1348	11:00	76	16:45	170	07/24/09	1478
Salvador Avenue	02	West of Sunnydale Lane	East	07/26/07	1387	7:45	121	15:30	107	07/27/07	1671
Salvador Avenue	02	West of Sunnydale Lane	West	07/26/07	1470	11:00	86	16:45	196	07/27/07	1694
Salvador Avenue	02	West of Sunnydale Lane	East	07/23/09	1313	7:30	103	15:30	104	07/24/09	1457

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Salvador Avenue	02	West of Sunnydale Lane	West	07/23/09	1334	11:00	74	16:30	172	07/24/09	1459
Salvador Avenue	03	East of Sunnydale Lane	East	07/26/07	1358	6:45	117	14:30	104	07/27/07	1621
Salvador Avenue	03	East of Sunnydale Lane	West	07/26/07	1456	10:45	100	15:45	197	07/27/07	1688
Salvador Avenue	03	East of Sunnydale Lane	East	07/23/09	1287	7:30	105	15:30	101	07/24/09	1445
Salvador Avenue	03	East of Sunnydale Lane	West	07/23/09	1330	11:00	74	16:30	173	07/24/09	1447
Salvador Avenue	04	West of Big Ranch Road	East								
Salvador Avenue	04	West of Big Ranch Road	West								
Salvador Avenue	04	West of Big Ranch Road	East	07/23/09	1290	7:30	104	15:30	102	07/24/09	1431
Salvador Avenue	04	West of Big Ranch Road	West	07/23/09	1319	11:00	73	16:30	170	07/24/09	1449
Sanitarium Road	01	North of Deer Park Road	North	08/13/07	1473	7:45	116	17:15	125	08/14/07	1684
Sanitarium Road	01	North of Deer Park Road	South	08/13/07	1626	7:45	160	15:00	163	08/14/07	1876
Sanitarium Road	02	South of Deer Park Road	North	08/13/07	990	5:30	65	15:30	109	08/14/07	1162
Sanitarium Road	02	South of Deer Park Road	South	08/13/07	1167	6:15	148	14:00	107	08/14/07	1333
Shaw-Williams Road	N/A	West of Franz Valley School Road	East	04/20/06	27	8:45	4	15:00	4	04/26/06	37
Shaw-Williams Road	N/A	West of Franz Valley School Road	West	04/20/06	27	6:45	4	12:30	3	04/26/06	38
Silverado Trail	01	North of Trancas Street	North	06/09/05	5358	6:15	428	15:00	363	06/10/05	6211
Silverado Trail	01	North of Trancas Street	South	06/09/05	5356	10:30	338	15:30	731	06/10/05	5858
Silverado Trail	02	South of Hardman Avenue	North								
Silverado Trail	02	South of Hardman Avenue	South								
Silverado Trail	03	North of Hardman Avenue	North								
Silverado Trail	03	North of Hardman Avenue	South								
Silverado Trail	04	South of Soda Canyon Road	North								
Silverado Trail	04	South of Soda Canyon Road	South								
Silverado Trail	05	North of Soda Canyon Road	North								
Silverado Trail	05	North of Soda Canyon Road	South								
Silverado Trail	06	South of Petra Drive	North								
Silverado Trail	06	South of Petra Drive	South								
Silverado Trail	07	North of Petra Drive	North								
Silverado Trail	07	North of Petra Drive	South								
Silverado Trail	08	South of Oak Knoll Avenue	North								
Silverado Trail	08	South of Oak Knoll Avenue	South								
Silverado Trail	09	North of Oak Knoll Avenue	North								
Silverado Trail	09	North of Oak Knoll Avenue	South								
Silverado Trail	10	South of Yountville Crossroad	North	07/17/08	4752	7:30	462	14:45	339	07/18/08	5792
Silverado Trail	10	South of Yountville Crossroad	South	07/17/08	5692	11:00	280	16:00	955	07/18/08	6206
Silverado Trail	11	North of Yountville Crossroad	North	07/17/08	5054	7:30	515	14:45	359	07/17/08	5802
Silverado Trail	11	North of Yountville Crossroad	South	07/17/08	5791	11:00	291	16:00	970	07/17/08	6495
Silverado Trail	12	South of Oakville Crossroad	North	08/13/08	3295	7:30	392	13:30	339	08/14/08	5113
Silverado Trail	12	South of Oakville Crossroad	South	08/13/08	6265	11:00	343	15:45	981	08/14/08	6743
Silverado Trail	13	North of Oakville Crossroad	North	08/13/08	4991	7:30	470	14:45	385	08/15/08	6035
Silverado Trail	13	North of Oakville Crossroad	South	08/13/08	5976	11:00	341	15:45	914	08/15/08	6378
Silverado Trail	14	South of Skellenger Lane	North	08/22/08	4893	7:45	460	14:45	356	08/22/08	5861
Silverado Trail	14	South of Skellenger Lane	South	08/22/08	5859	11:00	332	15:45	866	08/22/08	6551
Silverado Trail	15	North of Skellenger Lane	North	08/22/08	4801	7:30	439	15:00	371	08/22/08	5832
Silverado Trail	15	North of Skellenger Lane	South	08/22/08	5425	7:15	302	15:30	775	08/22/08	5994
Silverado Trail	16	South of State Highway 128	North	06/18/03	5028	7:30	381	16:15	407	06/20/03	6072
Silverado Trail	16	South of State Highway 128	South	06/18/03	5520	7:15	302	16:00	704	06/20/03	5857
Silverado Trail	17	North of State Highway 128	North	06/18/03	5279	7:30	403	16:00	453	06/20/03	6385
Silverado Trail	17	North of State Highway 128	South	06/18/03	5493	7:15	316	16:30	644	06/20/03	5971
Silverado Trail	18	South of Zinfandel Lane	North	05/07/03	4688	6:30	383	15:00	422	05/09/03	5251
Silverado Trail	18	South of Zinfandel Lane	South	05/07/03	4889	6:30	345	15:15	594	05/09/03	5355
Silverado Trail	19	North of Zinfandel Lane	North	05/07/03	4628	6:30	340	15:15	471	05/09/03	5373
Silverado Trail	19	North of Zinfandel Lane	South	05/07/03	4393	6:30	321	14:45	466	05/09/03	4873
Silverado Trail	20	South of Taplin Road	North	04/22/03	4244	6:45	337	15:30	411	04/25/03	4793
Silverado Trail	20	South of Taplin Road	South	04/22/03	4228	6:30	316	14:30	438	04/25/03	4589
Silverado Trail	21	North of Taplin Road	North	04/22/03	4177	6:45	312	15:30	424	04/25/03	4719

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Silverado Trail	21	North of Taplin Road	South	04/22/03	4273	6:30	330	14:30	442	04/25/03	4624
Silverado Trail	22	South of Pope Street / Howell Mountain Road	North	04/22/03	4210	6:45	325	15:30	421	04/25/03	4731
Silverado Trail	22	South of Pope Street / Howell Mountain Road	South	04/22/03	4222	6:30	327	14:30	426	04/25/03	4612
Silverado Trail	23	North of Pope Street / Howell Mountain Road	North	04/22/03	3937	7:00	262	15:30	399	04/25/03	4346
Silverado Trail	23	North of Pope Street / Howell Mountain Road	South	04/22/03	4648	6:30	439	14:30	436	04/25/03	4918
Silverado Trail	24	South of Meadowood Road	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silverado Trail	24	South of Meadowood Road	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silverado Trail	25	North of Meadowood Road	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silverado Trail	25	North of Meadowood Road	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silverado Trail	26	South of Pratt Avenue	North	04/04/03	3791	7:00	259	15:30	379	04/04/03	4265
Silverado Trail	26	South of Pratt Avenue	South	04/04/03	4773	6:30	426	14:45	494	04/04/03	5144
Silverado Trail	27	North of Pratt Avenue	North	04/04/03	3799	11:00	241	15:30	378	04/04/03	4297
Silverado Trail	27	North of Pratt Avenue	South	04/04/03	4670	6:30	429	15:30	465	04/04/03	5036
Silverado Trail	28	South of Fawn Park Road	North	04/04/03	3759	11:00	237	15:30	381	04/04/03	4220
Silverado Trail	28	South of Fawn Park Road	South	04/04/03	4728	6:30	441	15:30	477	04/04/03	5117
Silverado Trail	29	North of Fawn Park Road	North	04/04/03	3844	6:45	253	15:30	391	04/04/03	4334
Silverado Trail	29	North of Fawn Park Road	South	04/04/03	4643	6:30	432	15:30	465	04/04/03	5002
Silverado Trail	30	South of Deer Park Road	North	04/04/03	2802	7:15	200	16:00	220	04/04/03	4229
Silverado Trail	30	South of Deer Park Road	South	04/04/03	3531	6:30	344	15:30	286	04/04/03	5060
Silverado Trail	31	North of Deer Park Road	North	04/04/03	2253	10:45	157	15:00	252	04/04/03	2701
Silverado Trail	31	North of Deer Park Road	South	04/04/03	2311	7:00	165	14:45	234	04/04/03	2316
Silverado Trail	32	South of Lodi Lane	North	03/25/03	2322	11:00	152	16:00	249	03/28/03	2821
Silverado Trail	32	South of Lodi Lane	South	03/25/03	2346	7:30	158	15:15	237	03/28/03	2450
Silverado Trail	33	North of Lodi Lane	North	03/25/03	1505	10:30	127	15:45	198	03/28/03	2781
Silverado Trail	33	North of Lodi Lane	South	03/25/03	1461	7:30	142	15:15	188	03/28/03	2547
Silverado Trail	34	South of Glass Mountain Road	North	03/25/03	2276	10:30	152	15:45	241	03/28/03	2767
Silverado Trail	34	South of Glass Mountain Road	South	03/25/03	2368	7:30	179	15:15	241	03/28/03	2530
Silverado Trail	35	North of Glass Mountain Road	North	03/25/03	2577	10:30	170	16:15	276	03/28/03	3097
Silverado Trail	35	North of Glass Mountain Road	South	03/25/03	2649	7:30	210	15:15	252	03/28/03	2813
Silverado Trail	36	South of Crystal Springs Road	North	03/25/03	2466	10:30	166	16:30	269	03/28/03	2950
Silverado Trail	36	South of Crystal Springs Road	South	03/25/03	2493	7:30	197	15:15	236	03/28/03	2627
Silverado Trail	37	North of Crystal Springs Road	North	03/25/03	2512	10:30	163	16:30	278	03/28/03	2986
Silverado Trail	37	North of Crystal Springs Road	South	03/25/03	2591	7:30	210	15:45	227	03/28/03	2695
Silverado Trail	38	South of Bale Lane	North	03/25/03	2534	10:30	165	16:30	281	03/28/03	2990
Silverado Trail	38	South of Bale Lane	South	03/25/03	2561	7:30	212	16:15	225	03/28/03	2668
Silverado Trail	39	North of Bale Lane	North	03/25/03	2300	10:30	151	16:15	255	03/28/03	2745
Silverado Trail	39	North of Bale Lane	South	03/25/03	2333	7:30	185	15:15	214	03/28/03	2442
Silverado Trail	40	South of Larkmead Lane	North	03/13/03	1944	11:00	139	16:15	242	03/18/03	2075
Silverado Trail	40	South of Larkmead Lane	South	03/13/03	1959	7:30	163	14:45	181	03/18/03	2112
Silverado Trail	41	North of Larkmead Lane	North	03/13/03	1957	11:00	136	15:45	241	03/18/03	2137
Silverado Trail	41	North of Larkmead Lane	South	03/13/03	2020	7:15	170	15:15	191	03/18/03	2167
Silverado Trail	42	South of Lommel Road	North	03/13/03	1946	11:00	134	16:15	240	03/18/03	2115
Silverado Trail	42	South of Lommel Road	South	03/13/03	2017	7:15	165	14:45	192	03/18/03	2167
Silverado Trail	43	North of Lommel Road	North	03/13/03	1893	11:00	137	16:30	248	03/18/03	2049
Silverado Trail	43	North of Lommel Road	South	03/13/03	1949	7:15	168	15:00	170	03/18/03	2078
Silverado Trail	44	South of Dunaweal Lane	North								
Silverado Trail	44	South of Dunaweal Lane	South								
Silverado Trail	45	North of Dunaweal Lane	North	10/09/07	2602	11:00	155	16:15	340	10/11/07	2881
Silverado Trail	45	North of Dunaweal Lane	South	10/09/07	2615	7:15	235	14:45	195	10/11/07	2701
Silverado Trail	46	South of Pickett Road	North	03/04/03	2185	11:00	143	16:15	282	03/07/03	2603
Silverado Trail	46	South of Pickett Road	South	03/04/03	2236	7:30	216	15:15	171	03/07/03	2400
Silverado Trail	47	North of Pickett Road	North	03/04/03	2182	11:00	145	16:15	282	03/07/03	2635
Silverado Trail	47	North of Pickett Road	South	03/04/03	2151	7:30	208	15:15	160	03/07/03	2302
Silverado Trail	48	South of Rosedale Road	North	03/04/03	2197	11:00	143	16:15	286	03/07/03	2616
Silverado Trail	48	South of Rosedale Road	South	03/04/03	2202	7:30	214	15:00	166	03/07/03	2365
Silverado Trail	49	North of Rosedale Road	North	03/04/03	2263	11:00	147	16:00	294	03/07/03	2691

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Silverado Trail	49	North of Rosedale Road	South	03/04/03	2295	7:00	220	15:00	175	03/07/03	2491
Silverado Trail	50	South of Brannen Street	North	03/04/03	2248	11:00	148	16:15	295	03/07/03	2709
Silverado Trail	50	South of Brannen Street	South	03/04/03	2325	7:00	221	15:15	180	03/07/03	2496
Silverado Trail	51	North of Brannen Street	North	03/04/03	1819	11:00	119	16:00	225	03/08/03	2200
Silverado Trail	51	North of Brannen Street	South	03/04/03	1859	6:15	179	15:15	133	03/08/03	1990
Silverado Trail	52	South of State Highway 29	North	03/04/03	1821	11:00	108	16:00	230	03/07/03	2168
Silverado Trail	52	South of State Highway 29	South	03/04/03	1838	7:00	182	15:00	136	03/07/03	1967
Skellenger Lane	01	West of Ponti Lane	East	08/22/08	530	11:00	36	15:45	106	08/25/08	735
Skellenger Lane	01	West of Ponti Lane	West	08/22/08	295	6:00	40	13:00	24	08/25/08	342
Skellenger Lane	02	East of Ponti Lane	East	08/22/08	545	10:15	40	15:30	110	08/25/08	762
Skellenger Lane	02	East of Ponti Lane	West	08/22/08	302	6:00	46	12:30	26	08/25/08	351
Skellenger Lane	03	West of Silverado Trail	East	08/22/08	507	10:15	41	15:30	93	08/25/08	765
Skellenger Lane	03	West of Silverado Trail	West	08/22/08	303	5:45	51	12:30	26	08/25/08	371
Snell Valley Road	01	East of Butts Canyon Road	East	04/24/07	293	8:45	10	15:45	44	04/25/07	322
Snell Valley Road	01	East of Butts Canyon Road	West	04/24/07	291	7:00	55	15:45	17	04/25/07	325
Snell Valley Road	02	West of Butts Canyon Road	East	04/24/07	274	7:00	51	15:45	14	04/25/07	306
Snell Valley Road	02	West of Butts Canyon Road	West	04/24/07	275	11:00	9	16:00	41	04/25/07	304
Soda Canyon Road	03	East of Loma Vista Road	East	07/11/03	391	4:30	74	16:30	25	07/14/03	464
Soda Canyon Road	03	East of Loma Vista Road	West	07/11/03	396	7:00	35	15:00	67	07/14/03	470
Solano Avenue	01	South of Oak Knoll Avenue	North	02/05/03	1041	8:30	173	13:15	74	02/06/03	1153
Solano Avenue	01	South of Oak Knoll Avenue	South	02/05/03	1018	11:00	48	17:30	165	02/06/03	1051
Solano Avenue	02	North of Oak Knoll Avenue	North	02/05/03	1101	8:45	106	13:30	90	02/07/03	1202
Solano Avenue	02	North of Oak Knoll Avenue	South	02/05/03	1132	11:00	58	16:30	137	02/07/03	1190
Solano Avenue	03	South of Darms Lane	North	02/05/03	760	8:30	88	16:15	65	02/06/03	814
Solano Avenue	03	South of Darms Lane	South	02/05/03	800	8:30	51	17:00	107	02/06/03	851
Solano Avenue	04	North of Darms Lane	North	02/05/03	705	8:30	88	14:30	57	02/06/03	745
Solano Avenue	04	North of Darms Lane	South	02/05/03	746	8:30	42	16:45	101	02/06/03	780
Solano Avenue	05	South of State Highway 29 Access	North	02/05/03	703	8:30	87	14:30	57	02/06/03	753
Solano Avenue	05	South of State Highway 29 Access	South	02/05/03	746	8:30	42	17:00	101	02/06/03	785
Solano Avenue	06	North of State Highway 29 Access	North	02/05/03	793	8:30	88	16:15	67	02/06/03	840
Solano Avenue	06	North of State Highway 29 Access	South	02/05/03	721	8:30	45	16:45	98	02/06/03	775
Solano Avenue	07	South of Hoffman Lane	North	02/05/03	670	8:30	88	16:15	58	02/06/03	726
Solano Avenue	07	South of Hoffman Lane	South	02/05/03	599	11:00	35	16:45	89	02/06/03	662
Solano Avenue	08	North of Hoffman Lane	North	02/05/03	766	8:15	92	16:00	70	02/06/03	841
Solano Avenue	08	North of Hoffman Lane	South	02/05/03	639	11:00	34	16:45	90	02/06/03	688
Solano Avenue	09	Yountville Town Limit	North	02/05/03	743	8:15	90	16:15	67	02/06/03	814
Solano Avenue	09	Yountville Town Limit	South	02/05/03	630	11:00	34	16:30	85	02/06/03	679
Soscol Ferry Road	01	West of State Highway 29	East	09/30/04	2292	11:00	99	16:30	749	09/30/04	3170
Soscol Ferry Road	01	West of State Highway 29	West	09/30/04	703	7:30	190	12:30	65	09/30/04	925
Soscol Ferry Road	02	Napa City Limits	East	09/30/04	2255	11:00	88	16:30	774	09/30/04	3297
Soscol Ferry Road	02	Napa City Limits	West	09/30/04	579	7:30	173	12:30	54	09/30/04	797
South Fork Diamond Mountain Road	N/A	South of Diamond Mountain Road	North	05/03/05	17	10:30	2	13:30	3	05/06/05	26
South Fork Diamond Mountain Road	N/A	South of Diamond Mountain Road	South	05/03/05	16	8:15	2	15:15	2	05/06/05	24
Spanish Flat Loop Road - North	N/A	East of Berryessa-Knoxville Road	East	04/28/04	10	11:00	1	15:00	1	05/02/04	10
Spanish Flat Loop Road - North	N/A	East of Berryessa-Knoxville Road	West	04/28/04	31	11:00	2	14:15	3	05/02/04	51
Spanish Flat Loop Road - South	N/A	East of Berryessa-Knoxville Road	East	04/28/04	99	11:00	7	19:15	8	05/02/04	145
Spanish Flat Loop Road - South	N/A	East of Berryessa-Knoxville Road	West	04/28/04	71	7:00	10	15:00	6	05/02/04	67
Spring Mountain Road	01	Napa / Sonoma County Line	East	03/29/06	217	6:15	24	16:15	22	03/29/06	265
Spring Mountain Road	01	Napa / Sonoma County Line	West	03/29/06	203	9:30	17	15:30	29	03/29/06	247
Spring Mountain Road	02	West of Langtry Road	East	03/29/06	316	7:45	27	15:45	37	03/30/06	377
Spring Mountain Road	02	West of Langtry Road	West	03/29/06	299	8:00	29	15:30	33	03/30/06	357
Spring Mountain Road	03	East of Langtry Road	East	03/29/06	346	7:00	30	15:30	46	03/30/06	413
Spring Mountain Road	03	East of Langtry Road	West	03/29/06	330	8:00	35	15:30	33	03/30/06	393
Spring Mountain Road	04	St. Helena City Limit	East	03/29/06	421	11:00	40	15:30	59	03/30/06	517
Spring Mountain Road	04	St. Helena City Limit	West	03/29/06	407	6:15	45	15:15	33	03/30/06	498
Steele Canyon Road	01	East of State Highway 128	East	03/03/08	526	8:15	18	17:45	78	03/07/08	578

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Steele Canyon Road	01	East of State Highway 128	West	03/03/08	533	6:45	109	14:15	26	03/07/08	571
Steele Canyon Road	02	Entrance to Berryessa Highlands Subdivision	East	03/03/08	472	9:45	15	17:30	75	03/07/08	506
Steele Canyon Road	02	Entrance to Berryessa Highlands Subdivision	West	03/03/08	348	6:45	60	15:30	20	03/07/08	390
Sugarloaf Drive	N/A	West of Berryessa-Knoxville Road	East	04/28/04	27	6:00	5	15:00	3	04/29/04	32
Sugarloaf Drive	N/A	West of Berryessa-Knoxville Road	West	04/28/04	27	10:15	3	15:15	5	04/29/04	33
Sunnydale Drive	N/A	South of Salvador Avenue	North	07/26/07	74	8:30	9	15:00	8	07/27/07	86
Sunnydale Drive	N/A	South of Salvador Avenue	South	07/26/07	75	10:45	7	17:15	8	07/27/07	89
Sunnydale Drive	N/A	South of Salvador Avenue	North	07/23/09	61	9:45	5	13:30	5	07/27/09	72
Sunnydale Drive	N/A	South of Salvador Avenue	South	07/23/09	60	11:00	3	14:30	8	07/27/09	69
Sunnyside Drive	01	East of Sanitarium Road	East								
Sunnyside Drive	01	East of Sanitarium Road	West								
Sunnyside Drive	02	West of Deer Park Road	East	11/06/07	102	7:30	13	14:45	13	11/09/07	127
Sunnyside Drive	02	West of Deer Park Road	West	11/06/07	109	8:00	15	17:00	9	11/09/07	134
Sunnyside Drive	03	East of Deer Park Road	West	11/06/07	321	8:00	68	14:15	33	11/08/07	404
Sunnyside Drive	03	East of Deer Park Road	East	11/06/07	324	8:00	73	14:45	37	11/08/07	411
Taplin Road	N/A	East of Silverado Trail	East	04/22/03	212	6:45	38	12:00	23	04/23/03	278
Taplin Road	N/A	East of Silverado Trail	West	04/22/03	213	10:45	28	14:45	39	04/23/03	278
Tejas Avenue	N/A	North of Imola Avenue	North	02/03/05	306	11:00	16	15:30	34	02/09/05	354
Tejas Avenue	N/A	North of Imola Avenue	South	02/03/05	272	7:15	29	15:00	20	02/09/05	308
Trubody Lane	N/A	East of Washington Street	East	02/19/03	55	7:15	15	12:30	6	02/25/03	79
Trubody Lane	N/A	East of Washington Street	West	02/19/03	54	7:45	6	17:15	15	02/25/03	79
Tubbs Lane	04	South of Bennett Lane	North	11/05/02	2563	11:00	111	17:45	351	11/06/02	2912
Tubbs Lane	04	South of Bennett Lane	South	11/05/02	2490	7:30	316	12:30	157	11/06/02	2793
Tubbs Lane	05	North of Bennett Lane	North	11/05/02	2343	11:00	99	17:00	317	11/06/02	2593
Tubbs Lane	05	North of Bennett Lane	South	11/05/02	2520	7:15	319	16:00	166	11/06/02	2896
Tubbs Lane	06	South of State Highway 29	North	11/05/02	2507	11:00	109	17:30	360	11/06/02	2843
Tubbs Lane	06	South of State Highway 29	South	11/05/02	2418	7:15	322	14:30	151	11/06/02	2704
Vichy Avenue	01	North of Hagen Road	North	11/15/08	873	8:30	141	15:30	108	11/21/08	1060
Vichy Avenue	01	North of Hagen Road	South	11/15/08	869	8:45	140	15:30	129	11/21/08	983
Vichy Avenue	02	South of La Grande Avenue	North	11/15/08	795	8:30	152	15:30	101	11/21/08	967
Vichy Avenue	02	South of La Grande Avenue	South	11/15/08	795	8:45	137	15:30	129	11/21/08	887
Vichy Avenue	03	North of La Grande Avenue	North	11/15/08	808	8:30	164	15:15	111	11/21/08	964
Vichy Avenue	03	North of La Grande Avenue	South	11/15/08	810	8:30	135	15:30	137	11/21/08	900
Vichy Avenue	04	South of State Highway 121 (Monticello Road)	North	11/15/08	934	7:45	195	14:45	148	11/21/08	1122
Vichy Avenue	04	South of State Highway 121 (Monticello Road)	South	11/15/08	945	7:45	205	14:00	155	11/21/08	1101
Wall Road	N/A	North of Dry Creek Road	North	06/08/05	70	4:15	8	13:45	6	06/11/05	84
Wall Road	N/A	North of Dry Creek Road	South	06/08/05	69	5:45	8	14:15	10	06/11/05	82
Washington Street	01	South of State Highway 29 Access	North	02/19/03	73	8:30	9	14:30	8	02/25/03	84
Washington Street	01	South of State Highway 29 Access	South	02/19/03	72	11:00	5	15:15	10	02/25/03	81
Washington Street	02	North of State Highway 29 Access	North	02/19/03	193	7:15	24	13:15	19	02/21/03	236
Washington Street	02	North of State Highway 29 Access	South	02/19/03	165	8:30	14	17:00	24	02/21/03	171
Washington Street	03	South of Trubody Lane	North	02/19/03	185	7:30	24	13:00	18	02/21/03	234
Washington Street	03	South of Trubody Lane	South	02/19/03	158	9:15	14	17:00	24	02/21/03	172
Washington Street	04	North of Trubody Lane	North	02/19/03	166	10:30	15	17:30	17	02/25/03	191
Washington Street	04	North of Trubody Lane	South	02/19/03	140	9:15	14	15:45	16	02/25/03	157
Washington Street	05	South of Ragatz Lane	North	02/19/03	153	7:30	15	16:00	15	02/25/03	180
Washington Street	05	South of Ragatz Lane	South	02/19/03	128	9:15	13	16:00	15	02/25/03	139
Washington Street	06	North of Ragatz Lane	North	02/19/03	148	8:30	18	14:30	17	02/25/03	170
Washington Street	06	North of Ragatz Lane	South	02/19/03	121	9:00	11	16:15	13	02/25/03	138
Washington Street	07	South of State Highway 29 Access	North	02/19/03	150	8:30	18	14:30	17	02/25/03	177
Washington Street	07	South of State Highway 29 Access	South	02/19/03	125	9:00	14	16:00	15	02/25/03	148
Washington Street	08	North of State Highway 29 Access	North	02/19/03	253	8:15	24	15:45	24	02/21/03	308
Washington Street	08	North of State Highway 29 Access	South	02/19/03	175	9:00	13	14:45	19	02/21/03	178
Washington Street	09	Yountville Town Limit	North	02/19/03	255	8:45	22	16:15	25	02/22/03	280
Washington Street	09	Yountville Town Limit	South	02/19/03	177	9:15	12	15:30	18	02/22/03	218
Washington Street	10	Yountville Town Limit	North	03/02/05	435	11:00	42	12:30	41	03/04/05	508

Road Name	ID	Location	Direction	Date	ADT	AM Peak time	AM Peak vol	PM Peak time	PM Peak vol	Peak Day	Peak Day vol
Washington Street	10	Yountville Town Limit	South	03/02/05	414	11:00	30	16:45	60	03/04/05	434
Washington Street	11	South of State Highway 29	North	03/02/05	424	11:00	40	13:00	41	03/04/05	499
Washington Street	11	South of State Highway 29	South	03/02/05	403	11:00	28	16:45	59	03/04/05	417
West Zinfandel Lane	N/A	West of State Highway 29/128	East	03/29/05	229	11:00	23	15:00	29	04/01/05	280
West Zinfandel Lane	N/A	West of State Highway 29/128	West	03/29/05	237	7:45	29	13:15	22	04/01/05	306
White Cottage Road	01	North of Deer Park Road / Howell Mountain Road	North	08/13/07	730	11:00	42	17:30	81	08/17/07	829
White Cottage Road	01	North of Deer Park Road / Howell Mountain Road	South	08/13/07	823	7:15	96	14:45	67	08/17/07	871
White Sulphur Springs Road	N/A	St. Helena City Limit	East	03/10/04	183	11:00	14	16:30	26	03/10/04	193
White Sulphur Springs Road	N/A	St. Helena City Limit	West	03/10/04	177	7:45	16	13:15	19	03/10/04	194
Whitehall Lane	N/A	West of State Highway 29/128	East	03/29/05	323	9:00	30	16:00	57	04/01/05	383
Whitehall Lane	N/A	West of State Highway 29/128	West	03/29/05	309	6:00	42	13:30	26	04/01/05	379
Wooden Valley Crossroad	01	East of Wooden Valley Road	East	05/02/08	69	8:15	4	16:45	9	05/02/08	86
Wooden Valley Crossroad	01	East of Wooden Valley Road	West	05/02/08	66	7:15	7	14:45	6	05/02/08	77
Wooden Valley Crossroad	02	West of Gordon Valley Road	East	05/02/08	84	8:15	6	16:00	10	05/03/08	108
Wooden Valley Crossroad	02	West of Gordon Valley Road	West	05/02/08	95	7:15	9	14:45	8	05/03/08	131
Wooden Valley Road	01	Napa/Solano County Line	North	05/02/08	892	7:00	142	16:45	62	05/02/08	1030
Wooden Valley Road	01	Napa/Solano County Line	South	05/02/08	1176	7:00	53	16:45	259	05/02/08	1576
Wooden Valley Road	02	South of Wooden Valley Crossroad	North	05/02/08	887	7:00	142	16:45	63	05/02/08	1036
Wooden Valley Road	02	South of Wooden Valley Crossroad	South	05/02/08	903	7:45	37	16:45	184	05/02/08	1550
Wooden Valley Road	03	North of Wooden Valley Crossroad	North	05/02/08	887	7:00	147	17:15	58	05/02/08	1040
Wooden Valley Road	03	North of Wooden Valley Crossroad	South	05/02/08	1163	7:00	52	16:45	266	05/02/08	1555
Wooden Valley Road	04	South of State Highway 121	North	05/02/08	920	6:00	150	15:15	64	05/02/08	1053
Wooden Valley Road	04	South of State Highway 121	South	05/02/08	1224	5:00	61	15:30	268	05/02/08	1641
Wragg Canyon Road	N/A	North of State Highway 128	North	03/03/08	48	10:30	4	16:15	4	03/09/08	71
Wragg Canyon Road	N/A	North of State Highway 128	South	03/03/08	47	6:30	5	16:00	4	03/09/08	92
Yount Mill Road	01	North of Yountville Town Limit	North	03/02/05	105	10:00	8	12:00	12	03/05/05	140
Yount Mill Road	01	North of Yountville Town Limit	South	03/02/05	116	7:15	10	16:30	14	03/05/05	122
Yount Mill Road	02	South of State Highway 29/128	North	03/02/05	105	8:15	9	16:30	13	03/07/05	129
Yount Mill Road	02	South of State Highway 29/128	South	03/02/05	115	8:15	10	16:30	12	03/07/05	141
Yountville Crossroad	01	Yountville Town Limit	East	07/17/08	1178	7:30	100	14:30	101	07/17/08	1602
Yountville Crossroad	01	Yountville Town Limit	West	07/17/08	1517	11:00	104	16:30	211	07/17/08	1761
Yountville Crossroad	02	West of Finnell Road	East	07/17/08	1169	7:30	100	14:30	100	07/17/08	1593
Yountville Crossroad	02	West of Finnell Road	West	07/17/08	1502	11:00	104	16:30	207	07/17/08	1734
Yountville Crossroad	03	East of Finnell Road	East	07/17/08	1313	7:30	108	14:30	117	07/17/08	1744
Yountville Crossroad	03	East of Finnell Road	West	07/17/08	1620	11:00	115	16:30	226	07/17/08	1879
Yountville Crossroad	04	West of State Lane	East	07/17/08	520	6:00	44	17:15	58	07/17/08	1749
Yountville Crossroad	04	West of State Lane	West	07/17/08	583	11:00	45	15:15	86	07/17/08	1891
Yountville Crossroad	05	East of State Lane	East	07/17/08	1239	7:30	104	14:30	120	07/17/08	1649
Yountville Crossroad	05	East of State Lane	West	07/17/08	1606	11:00	115	16:30	219	07/17/08	1872
Yountville Crossroad	06	West of Silverado Trail	East	07/17/08	1288	7:30	109	14:45	129	07/17/08	1612
Yountville Crossroad	06	West of Silverado Trail	West	07/17/08	1641	11:00	119	16:30	222	07/17/08	1843
Zinfandel Lane	01	East of State Highway 29/128	East	05/07/03	1467	7:15	128	14:30	172	05/09/03	1884
Zinfandel Lane	01	East of State Highway 29/128	West	05/07/03	1239	6:30	140	14:30	121	05/09/03	1487
Zinfandel Lane	02	West of Silverado Trail	East	05/07/03	1202	7:15	86	15:15	175	05/09/03	1510
Zinfandel Lane	02	West of Silverado Trail	West	05/07/03	994	6:30	115	4:30	98	05/09/03	1166

Revised September 22, 2009

Attachment 24

A MODELING AND GEOSPATIAL APPROACH TO PREDICTING EFFECTS ON BIODIVERSITY DUE TO VINEYARD EXPANSION IN NAPA COUNTY

A Thesis

Presented to the faculty of the Department of Biological Sciences

California State University, Sacramento

Submitted in partial satisfaction of
the requirements for the degree of

MASTER OF SCIENCE

in

BIOLOGICAL SCIENCES
(Biological Conservation)

by

Eric E. Link

SUMMER
2012

A MODELING AND GEOSPATIAL APPROACH TO PREDICTING EFFECTS ON BIODIVERSITY DUE TO VINEYARD EXPANSION IN NAPA COUNTY

A Thesis

by

Eric E. Link

Approved by:

_____, Committee Chair
Miles Roberts, Ph.D

_____, Second Reader
Jamie Kneitel, Ph.D

_____, Third Reader
Brett Holland, Ph.D

_____
Date

Student: Eric E. Link

I certify that this student has met the requirements for format contained in the University format manual, and that this thesis is suitable for shelving in the Library and credit is to be awarded for the thesis.

_____, Graduate Coordinator _____
Ronald Coleman, Ph.D Date

Department of Biological Sciences

Abstract

of

A MODELING AND GEOSPATIAL APPROACH TO PREDICTING EFFECTS ON BIODIVERSITY DUE TO VINEYARD EXPANSION IN NAPA COUNTY

by

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Geographic Information Systems (GIS) have become an important tool in conservation biology. From identifying conservation priority areas to managing plant genetic diversity, GIS analysis is a key resource in evaluating and assessing biodiversity throughout the world. Researchers studying global biodiversity have identified 25 areas of extraordinary biological diversity, colloquially termed hotspots. A hotspot contains high densities of endemic species and is also in danger due to significant and ongoing habitat loss. Anthropogenic activities such as mining, urban development, and farming are major players in endangering hotspots.

Napa County lies within the heart of one of the world's 25 known biological hotspots. The California Floristic Province contains high numbers of native and endemic plant species. Agriculture is the leading industry in Napa County, contributing nearly a half a billion dollars per year to California's economy. Unfortunately, agricultural activities are some of the leading contributors that threaten biodiversity in Napa County. Conservation of species and ecosystems are an important task facing the County.

A Geographic Information System (GIS) was employed to examine how future vineyard expansion will affect biodiversity within Napa County, and that geospatial analysis can identify areas of threatened biodiversity due to vineyard expansion. There were 3 objectives of this research; 1) To predict future vineyard locations throughout Napa County through GIS analysis, 2) to identify ecosystems and special status species that will be threatened by future vineyard development and 3) to detect potential disruption of wildlife corridors due to vineyard growth.

The research was organized into four phases to address objectives 1–3. Phase 1 included development of an existing vineyard GIS layer. Phase 2 analyzed current literature and existing vineyards to reveal physical and geographic characteristics of existing Napa county vineyards. Phase 3 applied the revealed existing vineyard characteristics to all of the remaining land within Napa County in order to find out where future vineyards were most likely to be located. And phase 4 analyzed impacts to biodiversity resulting from future vineyard expansion.

Results from phase 4 revealed four critical ecosystems that could potentially lose from 51% to 93% of their total area within the County. Twenty-three special status species from six different taxon groups were identified. Impact analysis revealed eleven out of the twelve botanical species experienced potential habitat loss of 59% or above from potential vineyard expansion. The Bald eagle showed a 57% habitat loss, the most loss out of the 5 bird species studied. Both amphibians and mammals were represented by one species each and included the California red-legged frog and Salt-marsh harvest

mouse. Both species showed less than a 30% reduction in habitat. Three invertebrates were analyzed and the Valley elderberry longhorn beetle was shown to potentially lose 65% of its habitat due to viticulture.

Thirty nine potential corridors in danger of disruption due to an increase in vineyard development were identified. Utilizing GIS analysis to visualize and determine habitat fragmentation that potentially may affect biodiversity, species rich patches were prioritized for corridor connectivity; and intended to provide reconnaissance level identification of corridor locations within Napa County for natural resource experts and conservation planners.

The results from this analysis can benefit wildlife management and land-use decision making within the County.

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_____
Date

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INTRODUCTION

Geographic Information Systems (GIS) have become an important tool in conservation biology. A GIS system, which is composed of both hardware (i.e. computer and/or global positioning system) and software, manipulates data that is tied to specific locations on earth. It identifies relationships, patterns and trends in geographical data that might not otherwise be apparent. From identifying conservation priority areas to managing plant genetic diversity, GIS analysis is a powerful technique to evaluate biodiversity throughout the world (Jarvis et al., 2005; Naesset, 1997; Osborn and Parker, 2003; Salem, 2001). Researchers studying the world's biodiversity have identified 25 areas of extraordinary biological diversity, colloquially termed hotspots (Myers, 1988; Myers, 1990; Chaplin et al., 2000). A hotspot contains high densities of endemic species and is in danger due to significant and ongoing loss of habitat and species (Myers, 1988).

One of the world's hotspots is the California Floristic Province (CFP) located on the west coast of the United States. Distribution of the CFP occurs from the northern part of Baja California to the southern part of Oregon and holds 30 percent of the known insect species north of Mexico. It harbors more plant species than central and northeastern U.S. and Canada combined, and is identified as one of the world's 25 hotspots based on overall diversity and overall threats facing its biodiversity (Abbitt et al., 2000; Stein et al., 2000). Of the plant and vertebrate species that are found within the hotspot, 44 percent are endemic to California (Calsbeek et al., 2002).

Napa County, centrally located within the California Floristic Province, is a biological hotspot for multiple taxonomic groups (Parisi, 2003). It is considered one of the more diverse sub-regions found within the California Floristic Province hotspot (Conner et al., 2002). This is due to several factors. Elevation varies from sea level to 4000 ft. at the highest peaks. Soils are also very diverse in this region, varying from alluvial to serpentine. Because of regional air masses, proximity to the ocean and mountainous topography, there are many differing microclimates (Conner et al., 2002).

Study Area

A major factor that threatens biodiversity in Napa County is human conversion of natural habitats to agricultural production, which is often for viticulture purposes (Parisi, 2003; Opperman et al., 2005). Napa County is one of the smallest counties in California at just over 200,000 hectares. Yet when it comes to grape production, it is one of the largest contributors to California's economy. Since the first commercial wineries were established in 1864, large expanses of natural habitat have been converted to vineyards. Vineyard expansion continues. For example, in 2000 there were 284 wineries in Napa County; four years later 93 new wineries had been established and 3,076 forested hectares had been converted to vineyards (MKF Research, 2005). By 2006, 20,095 hectares of vineyards existed within Napa County representing 9.8 percent of the county's total land area (Napa County, 2011). Such habitat conversion may lead to substantial species loss. Currently, twenty-three species that can be found in the County have been listed as threatened, endangered or rare (CNDDB, 2011) and are represented in

Table 1. The goal of this study is to quantify the potential effects that viticulture may have on biodiversity within Napa County and determine which special status species and ecosystems are the most endangered by vineyard expansion.

Table 1. Special Status Designations of Species Found within Napa County.

Taxon Group	Common Name	Scientific Name	Federal Designation	State Designation
Amphibian	California red-legged frog	*Rana draytonii*	Threatened	None
Bird	Bald eagle	*Haliaeetus leucocephalus*	Delisted	Endangered
	California black rail	*Laterallus jamaicensis coturniculus*	None	Threatened
	California clapper rail	*Rallus longirostris obsoletus*	Endangered	Endangered
	Swainson's hawk	*Buteo swainsoni*	None	Threatened
	Western snowy plover	*Charadrius alexandrinus nivosus*	Threatened	None
Fish	Steelhead - Central California Coast	*Oncorhynchus mykiss irideus*	Threatened	None
Invertebrate	California freshwater shrimp	*Syncaris pacifica*	Endangered	Endangered
	Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	Threatened	None
	Vernal pool fairy shrimp	*Branchinecta lynchi*	Threatened	None
Mammal	Salt-marsh harvest mouse	*Reithrodontomys raviventris*	Endangered	Endangered
Plant	Burke's goldfields	*Lasthenia burkei*	Endangered	Endangered
	Calistoga popcorn-flower	*Plagiobothrys strictus*	Endangered	Threatened
	Clara Hunt's milk-vetch	*Astragalus claranus*	Endangered	Threatened
	Contra Costa goldfields	*Lasthenia conjugens*	Endangered	None
	Few-flowered navarretia	*Navarretia leucocephala ssp. pauciflora*	Endangered	Threatened
	Keck's checkerbloom	*Sidalcea keckii*	Endangered	None
	Mason's lilaeopsis	*Lilaeopsis masonii*	None	Rare
	Napa blue grass	*Poa napensis*	Endangered	Endangered
	Sebastopol meadowfoam	*Limnanthes vinculans*	Endangered	Endangered
	Showy rancheria clover	*Trifolium amoenum*	Endangered	None
	Soft bird's-beak	*Chloropyron molle ssp. molle*	Endangered	Rare
	Tiburon paintbrush	*Castilleja affinis ssp. neglecta*	Endangered	Threatened

A Geographic Information System (GIS) was employed to examine how future vineyard expansion will affect biodiversity within Napa County. There were 3 objectives of this research - 1) To predict future vineyard locations throughout Napa County through GIS analysis, 2) to identify ecosystems and special status species that will be threatened by future vineyard development and 3) to detect potential disruption of wildlife corridors due to vineyard growth. To address objectives 2 and 3 a vineyard expansion model (VEM) was developed. The model analyzed spatial datasets in order to identify characteristics from each that best represent vineyard site locations. The VEM then applied the characteristics to the output of the model resulting in predicted future vineyards. Utilizing the results of the vineyard expansion model, an impact analysis was used to identify impacts to special status species and ecosystems found within Napa County, fragmentation of species rich areas due to future vineyard expansion were also analyzed. Suggestions for corridor locations between fragmented areas are given. Application of this research can assist in environmental policy, land-use, wildlife conservation, environmental management, and restoration efforts.

MATERIALS AND METHODS

Environmental Systems Research Institute's (ESRI) ArcGIS Version 10 and Spatial Analyst software were utilized used in this study. The research is organized into four phases. Phase 1 consisted of populating a multilayer GIS geodatabase with various datasets that cover Napa County for analysis. Critical to the study, was a geospatial dataset of existing vineyards, however, the data did not exist. Therefore, Phase 1 included development of an existing vineyard GIS layer. Phase 2 analyzed current literature and existing vineyards to reveal physical and geographic characteristics of existing Napa county vineyards. Phase 3 applied the revealed existing vineyard characteristics to all of the remaining land within Napa County in order to find out where future vineyards are most likely to be located. And phase 4 analyzed impacts to biodiversity resulting from future vineyard expansion.

Phase 1 - Vineyard Expansion Model

From March 2010 through October 2011, GIS spatial datasets were collected from various State, Federal, County and Non-government sources or created when no data was available. Those datasets categorized as viticulture were obtained for their role in characterizing vineyard site suitability for the VEM (Table 2). All datasets were georeferenced to a common coordinate system (NAD 83 UTM Zone 10N).

Table 2. Datasets Used in the Vineyard Expansion Model and Biological Analyses.

Dataset	Data Source
Distance to Streams[1]	U.S. Geological Survey
Distance to Roads[1]	Napa County
Protected Lands (BPAD)[1]	GreenInfo Network
Land Ownership[1]	California Department of Fish and Game
Vegetation[2]	University California Davis (CAIN)
Wildlife Range Data (2008)[2]	California Department of Fish and Game
Species Richness (ACEII, 2011)[2]	California Department of Fish and Game
Elevation (10m)[2]	U.S. Geological Survey
National Hydrologic Dataset (2011)[2]	U.S. Geological Survey
Important Farmland[1]	U.S. Department of Agriculture
Slope[1]	Created from 10m Elevation Dataset
Solar Radiation[1]	Created from 10m Elevation Dataset
Vegetation[1]	U. S. Forest Service
Vineyard Pre 2010[1]	Digitized
Available Water Content[1]	National Resource Conservation Service (SSURGO)
Hydrologic Groups[1]	National Resource Conservation Service (SSURGO)
pH[1]	National Resource Conservation Service (SSURGO)
Depth to Bedrock[1]	National Resource Conservation Service (SSURGO)
Elevation (1ha)[1]	Created from U.S. Geological Survey

[1]Vineyard Expansion Model
[2]Biological Analyses

Existing vineyards were digitized from an orthorectified 1 meter resolution 2010 aerial image from the United States Department of Agriculture Farm Service Agency (FSA).

Phase 2 - Site Suitability Characteristics

A review of current literature revealed that specific physiographic and geographic characteristics drive vineyard site selection. These include slope, solar radiation, elevation, soils, vegetation, roads, and others (Jones et al., 2004; Merenlender, 1999; Heaton and Merenlender, 2000; Wolf and Boyer, 2003). Fourteen datasets representing vineyard characteristics identified through literature were used as inputs to the VEM (Table 2). Each characteristic was chosen based on its importance in vineyard site selection and is described below and represented in Table 3.

Merenlendar (1999) showed from modeling that vineyards were more likely to be established the closer they were to roads, and the opposite was true for perennial streams. Certain vegetation types also were found to favor vineyard development. The most favored were Blue oak woodlands, grasslands, shrub, “other” vegetation and if cultivated land was already present. Secondly came conifer and then urban. The least suitable vegetation types were wetlands and hardwood woodlands, with the exception of Blue oak woodlands as stated above. Riverine, lacustrine, and water were omitted from the analysis.

Table 3. Identified Vineyard Characteristic Suitability Values. Suitability values were determined based on literature review of previous studies. Dashed lines indicate that corresponding characteristics fall between high and low suitability values. For example, hydrologic unit “B” has a higher suitability value then “C” but lower then “A”.)

Dataset (Input)	Characteristics	Suitability
Hydrologic Units	A	High
	B	--
	C	--
	D	Low
Vegetation	Blue Oak Woodland, Grasslands, Shrub, "Other", Agriculture	High
	Conifer	--
	Urban	--
	Wetlands, Hardwood Woodlands	Low
Important Farmland	Unique Farmland	High
	Prime Farmland	--
	Farmland of Local Importance	--
	Grazing Land	--
	"Other Land"	Low
	Urban, Built-up, Water	Not Analyzed
Solar Radiation	42,918	High
	30,790	--
	22,704	Low
Slope (%)	1	High
	10	--
	20	--
	>30	Low
Elevation (m)	1	High
	200	--
	400	--
	600	--
	800	--
	>800	Low

Table 3 continued.

Dataset	Characteristics	Suitability
Depth to Bedrock (cm)	201	High
	--	--
	--	--
	25	Low
pH	7.8	High
	5.0	--
	<5.0	Low
Available Water Capacity (cm of water)	0.19	High
	--	--
	--	--
	0.05	Low
Distance to Roads (mi)	0.01	High
	3.20	--
	5.00	Low
Distance to Streams (mi)	1.30	High
	0.60	--
	0.10	Low

Important Farmland categories designated by the California Department of Conservation were also found to influence vineyard development and are rated according to soil quality and irrigation status. Beginning with the most suitable, the categories were as follows: Unique farmland, prime farmland, farmland of local importance, grazing land, and "other land." Urban, Built-up, and water were not considered conducive to vineyard site suitability and were not analyzed in this study (Marenlender, 1999).

Aspect is commonly used to predict solar intensity for given locations, because north facing slopes are known to have less intense sun exposure than south facing slopes. Longer daytime sun exposure is very desirable in grape production and results in an increase in ripening potential of the fruit. One problem with using simple aspects, a proxy for solar radiation, is that aspect does not take into consideration variations in seasonal solar fluctuations (Jones et al., 2004). In this study, solar radiation was chosen to substitute aspect as one of the input characteristics to the VEM.

Solar radiation was calculated as the sum of direct, diffuse and reflected radiation. Using the methods of Jones et al. (2004), a one-hectare digital elevation model was used as the input raster to the model in order to calculate the solar radiation for the growing season of wine grapes, which begins in April and ends in October. The model calculated solar radiation for six time periods (800, 1000, 1200, 1400, 1600, and 1800 hours) within the first day of each month of the growing season. Results of the model revealed a range of solar radiation values, and thus the ripening potential for all areas in Napa County. The range of values (22,704 kwh/m^2 – 42,918 kwh/m^2) were then grouped into suitability

classes where the highest values represented the most suitable solar radiation values (Table 3).

The percent slope is also important in contributing to vineyard productivity. One of the roles slope plays is combating frost damage to vines. Minimal slope can channel cold air away from a vineyard site thus reducing the risk to vines due to frost. Vineyards located in narrow flat valleys are more prone to frost and must incur costs to reduce this affect (Wolf and Boyer, 2003).

As a general rule, as slope increases the difficulty of developing and managing a vineyard increases. Steep hillside locations also have more of a chance of soil erosion (Jones and Hellman, 2003). Within Napa County, conservation regulations are in place and state "if a proposal (Erosion Control Plan) for a new vineyard development has over an acre of slopes above 30 percent, a use permit (requiring a public hearing before the Planning Commission, plus a number of specific "findings") must be obtained before the Erosion Control Plan can be approved. If there is any area over 50%, a Variance, with even more stringent requirements must be approved. There have been no such variances issued in the 20-year history of the Conservation Regulations" (Steiner, personal communication). Therefore, a conclusion can be made that as slope increases potential vineyard site suitability decreases due to physical and administrative requirements. Because of this trend, the lower slope values were given higher suitability. Percent slope within Napa County ranged from 0–83.

Elevation plays an integral part of determining the varietal of wine grape that may grow in a particular region. As elevation increases temperature decreases .61 ºC per 100

meters of change. This effect decreases a grape's growing potential and thus yield. Higher elevation is also directly correlated to higher frost damage and so, sites generally favor lower elevation due to these concerns. Lower elevation values were given a higher suitability potential then higher elevation values in the VEM (Jones and Hellman, 2003).

Many soil factors contribute to successful site selection of vineyards. This study evaluated four factors, namely depth to bedrock, pH, available water capacity and drainage potential (by hydrologic groups) which are commonly analyzed for determining site selection (Jones and Hellman, 2003; Jones and Hellman, 2004; Jones et al., 2003; Kurtural et al., 2007; Wolf and Boyer, 2003). A soils database (SSURGO 2007) for Napa County was obtained from the Natural Resource Conservation Service (NRCS). The dataset was used to evaluate the above soil factors in order to create a soil suitability spatial dataset for input into the VEM.

Bedrock is known as a "restrictive layer" within soil. A "restrictive layer" is defined as a nearly continuous layer that has "…properties which significantly impede the movement of water and air through the soil or that restrict roots…" (NRCS, 2007). Grapevine roots have been found to exceed 7 meters in length due to deep soils. Root length is an important factor for grape vines for several reasons. First, it allows for a greater surface area for absorption of needed nutrients. Long roots also allow for the ability for a vine to withstand more xeric conditions because the root can access more water (Sequin, 1986). The deeper the soil the more moisture content a soil generally has, thus, vines found on deeper soils have a greater ability to withstand dry periods than vines located on shallower soils (Jones et al., 2004). Depth to bedrock values for Napa

County ranged from 25 cm to over 200 cm. The highest values were given the highest suitability ranking for the depth to bedrock soil characteristic.

Soil pH is known to be an indicator for soil fertility. The optimum pH values for vineyards range from 6.0 to 8.0 (Jones et al., 2004). Values less than 5.0 can increase the solubility of aluminum around the roots, which precipitates essential micronutrients from the soil (Kurtural et al., 2006). Soil pH properties compared to other soil characteristics can be manipulated unlike elevation; however, such a practice increases cost to the grower. pH values throughout the County range from 4.4-7.8 respectively. Soil pH found within the County was grouped into 3 suitability categories with 4.4 being the least suitable and 7.8 within the range of most suitable.

The available water capacity (AWC) is an important factor when deciding on vineyard site suitability. AWC is the "quantity of water that the soil is capable of storing for use by plants" (NRCS, 2007). Soils that have the ability to hold more moisture reduce the importance of irrigation and thus cost to the grower (Wolf and Boyed, 2003). As stated earlier, AWC also allows vineyards to be established in dryer regions and/or tolerate periods of drought (Jones et al., 2004). Increasing AWC values were given higher suitability values and ranged from 0.05cm -0.19cm.

Site drainage is considered to be one of the more important characteristics in vineyard development (Jones et al., 2004). The ability for a site to drain is influenced by several factors such as slope, depth, and soil porosity. Soils are typically assigned to four hydrologic groups (A, B, C, and D) that describe soil infiltration rate. Group A is characterized by having high infiltration rates where group D has very slow infiltration

rates. Soils that are part of the D group consist of mostly clays (NRCS, 2007). These four groups were used in the VEM based on their water infiltration potential. Group A was given the highest suitability rank followed by B, C, and then D.

After all of the above suitability characteristics were identified, their corresponding GIS spatial dataset was imported into ArcGIS for analysis.

All vector datasets were converted to raster spatial datasets. Each raster dataset used 1 square hectare cells for GIS analysis. The cell size of 1 hectare was chosen because other studies in viticulture have shown that this size is adequate for analysis given extent of the study area (Marenlender, 1999). In addition, the analysis was limited by the vegetation spatial datasets due to their 1 hectare (100m x 100m) mapping unit resolution. Elevation, solar radiation, and slope were already in raster format so conversion of these datasets was not necessary.

Before the characteristics/variables could be used in the model, they were first numerically coded for analysis. This analysis used a suitability scale of 0-10 with 10 being the most suitable in order to normalize the character suitability rankings from Table 3. A scale of 0-10 was chosen because it allowed a greater range of suitability classifications resulting in a more accurate output from the VEM. For example, elevation ranged from 1-1281m. Utilizing a scale of 1-4 would have allowed for a larger elevation range value for each suitability class within the 1-4 scale (i.e. 1, 2, 3 and 4) thus making the future vineyard location dataset less accurate in identifying suitable vineyard locations. The reclass tool in the GIS was used to assign normalized values to each suitability characteristic. Each feature within a dataset used in the model was given a

value between “0-10.” Those determined to be a highly desirable characteristic of vineyards were assigned a “10,” those determine to be unfavorable a “1,” and a “0” if they were excluded from analysis (Table 4).

Table 4. Normalized Index Values of Vineyard Characteristics. Suitability values from table 3 were normalized to a scale of “1-10,” with “10” being the highest suitability value.

Dataset (Input)	Characteristics	Vineyard Expansion Model Index Value
Hydrologic Units	A	10
	B	7
	C	4
	D	1
Vegetation	Blue Oak Woodland, Grasslands, Shrub, "Other", Agriculture	10
	Conifer	7
	Urban	4
	Hardwood Woodlands, Wetlands	1
	Riverine, Lacustrine, Water	0
Important Farmland	Farmland of Statewide Importance	10
	Prime Farmland, Farmland of Local Importance	7
	Grazing Land	4
	"Other Land"	1
	Urban, Built-up, Water	0
Solar Radiation (KWH/m^2)	40,897 - 42,918	10
	38,876 - 40,897	9
	36,854 - 38,876	8
	34,833 - 36,854	7
	32,811 - 34,833	6
	30,790 - 32,811	5
	28,769 - 30,790	4
	26,747 - 28,769	3
	24,725 - 26,747	2
	22,704 - 24,725	1

Table 4 continued.

Dataset (Input)	Characteristics	Vineyard Expansion Model Index Value
Slope (%)	4.0 – 11	10
	0.0 – 4.0	8
	11 – 17	5
	17 – 22	3
	22 – 30	1
	28 – 33	1
	33 – 39	1
	39 – 50	1
	50 – 83	0
Elevation (m)	0 - 128	10
	128 - 256	9
	256 - 384	8
	384 - 512	7
	512 - 640	6
	640 - 769	5
	769 - 830	4
	830 - 1025	3
	1025 - 1153	2
	1153 - 1281	1
Depth to Bedrock (cm)	153-201	10
	104-153	7
	59-104	4
	25-59	1
pH	6.0 - 7.8	10
	5.0 – 6.0	5
	4.4 – 5.0	1
Available Water Capacity (cm of water)	0.15 - 0.19	10
	0.12 - 0.15	7
	0.09 - 0.12	4
	0.05 - 0.09	1

Table 4 continued.

Dataset (Input)	Characteristics	Vineyard Expansion Model Index Value
Distance to Roads (km)	0.0 - 0.87	10
	0.87 - 1.72	9
	1.72 – 2.59	8
	2.59 – 3.46	7
	3.46 – 4.31	6
	4.31 – 5.18	5
	5.18 – 6.05	4
	6.05 – 6.90	3
	6.90 – 7.77	2
	7.77 – 8.64	1
Distance to Streams (km)	1.83 – 2.06	10
	1.64 - 1.83	9
	1.43 - 1.64	8
	1.22 – 1.43	7
	1.03 – 1.22	6
	0.82 – 1.03	5
	0.61 - 0.82	4
	0.40 - 0.61	3
	0.16 - 0.40	2
	0.0 - 0.16	1

For example, slopes that are over 30% are not desirable because vineyard management and administrative costs become increasingly problematic. Those slopes with minimal values were given the highest rating and assigned a “10.”

The four soil datasets (AWC, pH, depth to bedrock, and hydrologic groups) were reclassed within a soil suitability model (Figure 1) that was developed in order to come up with a single soil suitability raster as an input to the VEM. The model consisted of reclassifying each dataset to a normalized scale index (i.e. 1-10) and then assigning a weight to each soil factor with drainage (hydrologic groups) given the highest weight (40%) and all other factors 20% (Jones et al., 2004). The rationale for the weighting criteria is that, of the four soil factors, drainage is the most important due to the vine’s inability to withstand excess water. A soils inability to drain sudden rain events can lead to bursting of the fruit and an increase potential of rot within the root system thus minimizing the vineyards production potential (Seguin, 1985).

Once all eleven datasets were converted to rasters and reclassed for analysis, an equation for summing them together was created.

"Elevation Index Raster" + “Vegetation Index Raster " + “Distance to Streams Index-Raster" + "Solar "Radiation Index Raster" + "Distance to Roads Index Raster" + "Important Farmland Index Raster" + "Slope Index Raster" + "Suitable Soil Index Raster) = Vineyard Suitability Raster

The product of the equation resulted in a new vineyard suitability raster (VSR) spatial dataset that contained a range of suitability index values for the entire County (Figure 2).

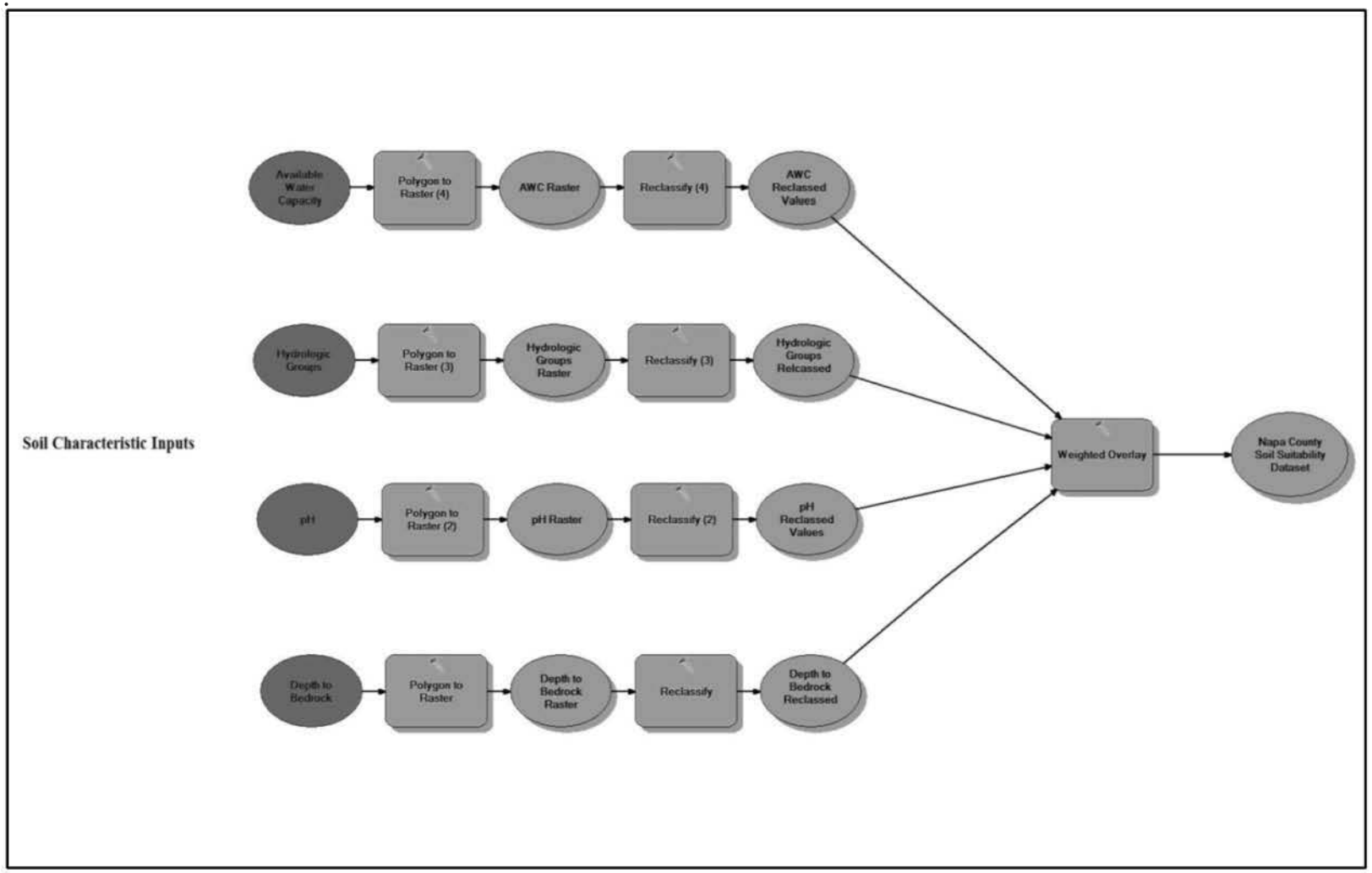


Figure 1. Soil Suitability Model.

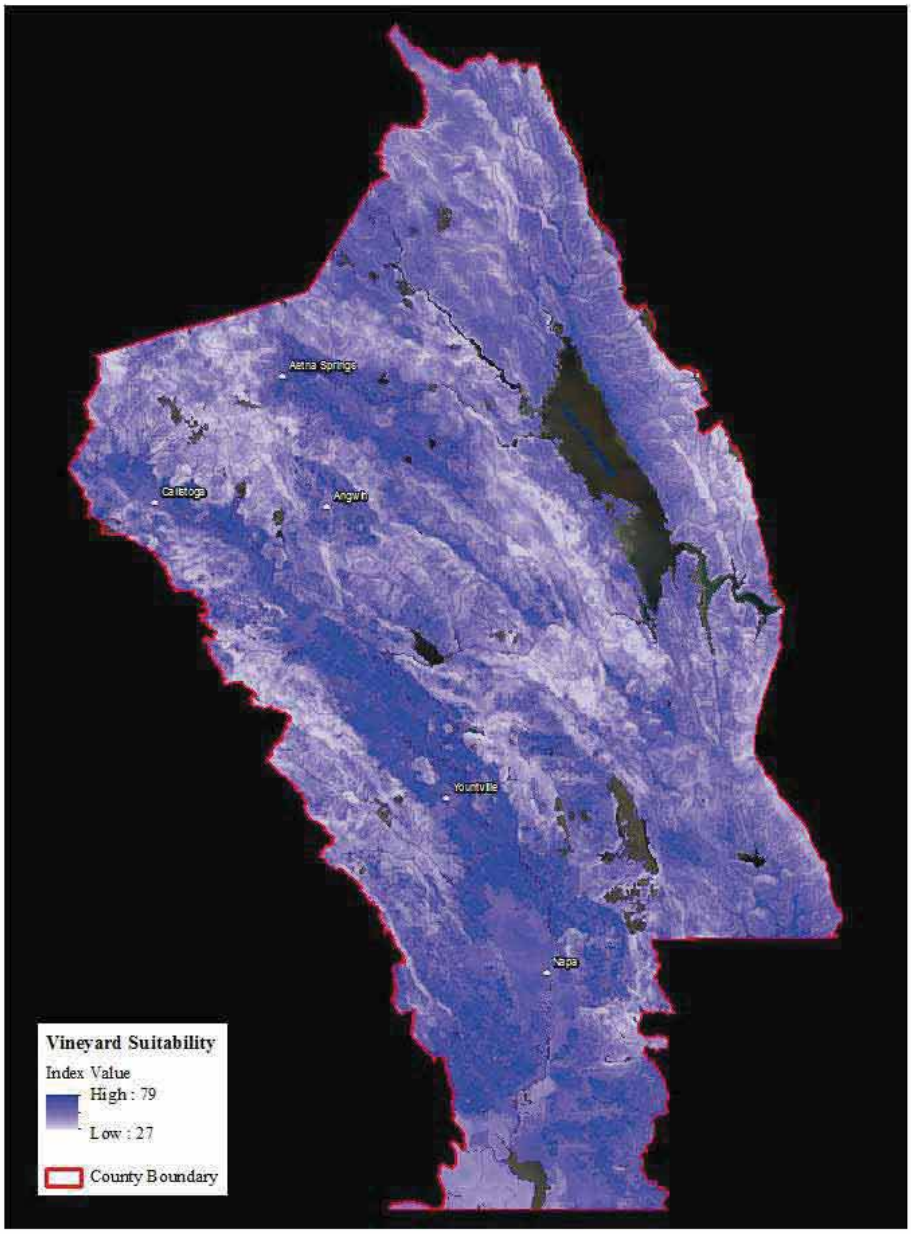


Figure 2. Resulting Dataset (Vineyard Suitability Raster) from the Vineyard Expansion Model Showing Suitability Values of Potential Future Vineyard Locations throughout Napa County.

Specifically, each cell of the vineyard suitability raster dataset contained the sum of all of the input characteristic index values that occupied the same 1-hectare cell. Next, the existing vineyards data was overlaid with the VSR in order to determine the range of suitability scores at existing vineyard areas. Thus, a range of vineyard suitability scores was developed based on existing vineyards in the study area.

Phase 3 – Future Vineyard Spatial Dataset Creation

Phase 2 identified the range of values from the vineyard suitability raster that characterize existing vineyards countywide. The range of values was applied to undeveloped land in Napa County in order to determine which areas are most likely to be developed and resulted in a potential vineyard expansion spatial dataset; that is, where vineyards are likely to be located in the future.

Finally, a GIS data layer that contained all lands that were unavailable to vineyard development was created. This spatial GIS data layer incorporated existing vineyards, roads, Federal lands, State lands, Non-profit lands owned in fee, developed land, and easement data that represented open space areas within Napa County that were protected and/or unavailable for development.

The unavailable land dataset was overlaid with the future vineyards dataset to find areas were vineyard development cannot legally occur. The output of the model resulted in a final dataset that predicted locations of future vineyards within Napa County. The vineyard expansion model developed is represented in Figure 3.

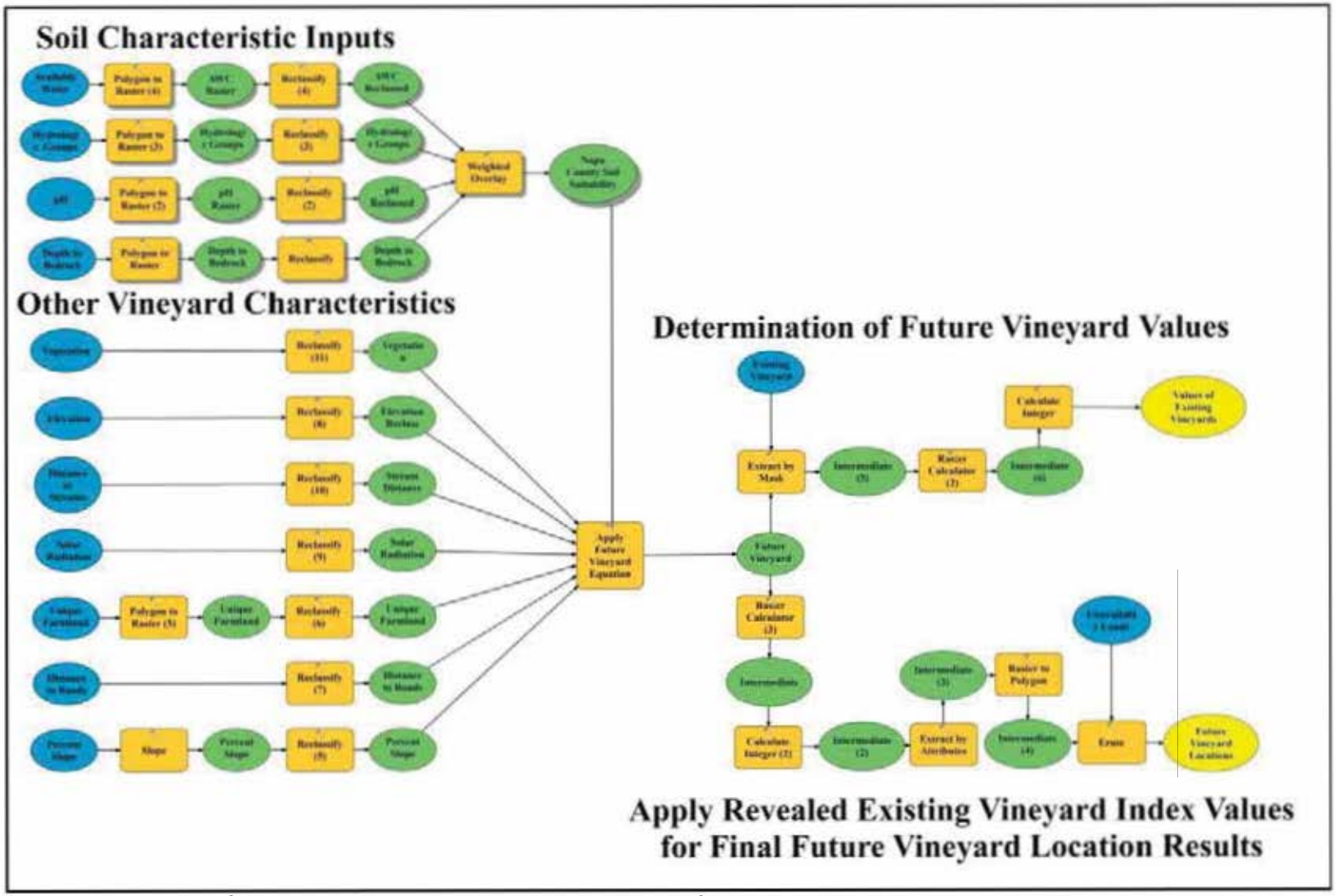


Figure 3. Diagram of the Vineyard Expansion Model Developed from Phases 1-3.

Phase 4 – Biological Analysis

Napa County is home to a variety of ecosystems, some of which are greatly restricted, such as California xeric serpentine chaparral. In order to determine potential effects to ecosystems within the County an impact analysis was implemented. Ecosystem GIS data was provided by NatureServe and utilized for identifying ecosystems within Napa County. NatureServe, a non-profit conservation organization, developed the data by means of a "bio-ecosystem" approach using a combination of plant communities and abiotic factors (Comer et al., 2003). The dataset identified 30 different ecosystems within the County, which are shown in Table 5. For all thirty ecosystem types, existing acreage was calculated. Next, the future vineyard locations GIS dataset was overlaid with each ecosystem in order to determine areas of overlap. Acreage was calculated where overlap was present; these are areas of significant vineyard expansion impacts to ecosystems. The percentage of each ecosystem left intact after the removal of the future vineyard locations was determined in order to explore the potential impacts that future vineyards have on ecosystems. This method was also used for quantifying potential impacts to listed individual botanical and wildlife species as available habitat maps allowed.

The 2011 California Natural Diversity Database (CNDDB), developed by the California Department of Fish and Game, was used for the identification of threatened, endangered and species of concern found within the County. Seventy records representing 23 species were identified within Napa County (Table 1). However, one of

Table 5. Ecosystem Impact Analysis Results.

Ecosystem	Existing Ecosystem (hectares)	Ecosystem Impacts (hectares)	Percent Ecosystem Loss
Agriculture – General	15,953.09	2,278.10	14%
California Mesic Chaparral	54,655.79	29,924.84	54%
Northern and Central California Dry-Mesic Chaparral	37,973.61	15,058.41	39%
Northern California Coastal Scrub	271.53	167.12	61%
California Xeric Serpentine Chaparral	4.23	3.93	93%
Klamath-Siskiyou Cliff and Outcrop	89.19	17.77	20%
Developed-Low Intensity	929.61	43.17	5%
Developed-Open Space	5,343.29	477.52	9%
Non-Specific Disturbed	786.78	128.50	16%
Mediterranean California Mesic Mixed Conifer Forest and Woodland	8.46	0.45	5%
California Montane Jeffrey Pine-(Ponderosa Pine) Woodland	33.39	11.75	35%
Mediterranean California Mixed Oak Woodland	152.37	54.79	36%
Mediterranean California Mixed Evergreen Forest	508.41	198.13	39%
Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland	1,630.98	686.34	42%
California Coastal Redwood Forest	2,401.28	1,056.42	44%
Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland	1,385.91	621.30	45%
Central and Southern California Mixed Evergreen Woodland	2.25	1.01	45%
East Cascades Oak-Ponderosa Pine Forest and Woodland	4.14	2.18	52%
North Pacific Oak Woodland	4,060.16	2,279.80	56%

Table 5 continued.

Ecosystem	Existing Ecosystem Area (hectares)	Ecosystem Impacts (hectares)	Percent Ecosystem Loss
California Northern Coastal Grassland	4.41	1.99	45%
North Pacific Montane Grassland	6,334.73	2,869.79	45%
Introduced Upland Vegetation - Perennial Grassland and Forbland	138.42	68.74	50%
California Annual Grassland	21,766.36	12,511.48	57%
Temperate Pacific Tidal Salt and Brackish Marsh	2,799.17	954.31	34%
Open Water	11,240.88	126.47	1%
North Pacific Montane Riparian Woodland and Shrubland	18.09	2.05	11%
Mediterranean California Foothill and Lower Montane Riparian Woodland	1,910.52	1,191.01	62%
California Montane Woodland and Chaparral	3,117.50	1,128.99	36%
California Lower Montane Blue Oak-Foothill Pine Woodland and Savanna	28,375.49	14,504.88	51%
California Coastal Live Oak Woodland and Savanna	2,667.50	1,392.69	52%

the species distribution range was determined not to fall within the County. In addition, two other species were associated with aquatic habitat, therefore, direct impact calculations were not applicable because vineyards are not developed on rivers or streams. As a result, twenty species were identified for the impact analysis. Each wildlife species and its associated range dataset were overlaid with their corresponding habitat, which was determined through literature review and selected from the CAIN vegetation GIS spatial dataset created by Thorne et al. (2004) (Appendix A). The CAIN vegetation dataset was used due to its detailed classification of vegetation types for Napa County. The area where both range and habitat datasets intersect was determined to be the maximum potential core habitat for each listed wildlife species found within Napa County (Appendix B). Next, future vineyard locations were overlaid with each species habitat to quantify potential habitat loss due to vineyard expansion. The same analysis was run for botanical species except elevation data was substituted for range data. This substitution was due to the lack of range data for botanical species.

For species that were associated with vernal pools, a modeled vernal pool dataset was created due to the unavailability of data for Napa County (Figure 4). Characteristics that favored vernal pools were identified through literature review and included; slopes 0-3 percent, 37-50 percent clay soils, and grassland vegetation communities (Hobson and Dahlgren, 1998; Smith and Verrill, 1996; Marty, 2005; Gerhardt and Collinge, 2003). First, a 0-3 percent slope dataset was created from a 10m Digital Elevation Model (DEM). Next, soils from the NRCS SSURGO spatial dataset were evaluated and selected

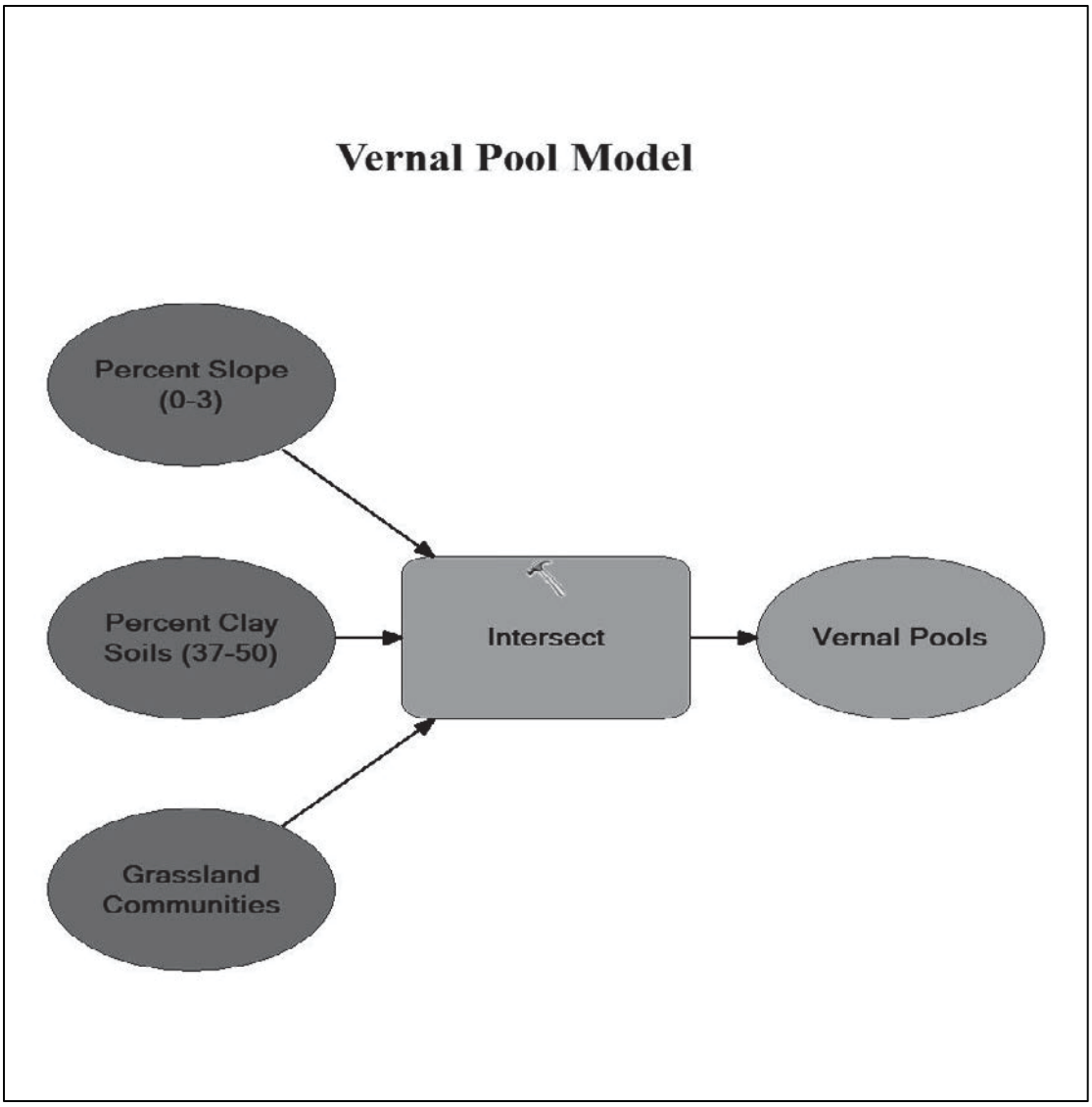


Figure 4. Vernal Pool Model.

for their percent clay composition within the first 60 cm of the soil. Once selected, a new percent clay soils dataset was created. Finally, California Annual Grasslands Alliance and Upland Annual Grasslands & Forbes Formation were selected from the CAIN vegetation dataset. All three datasets were then overlaid with each other and areas where all three intersected were considered potential vernal pool locations for Napa County.

The National Wetlands Inventory dataset, created by the United States Geological Service, was used for wetland habitat within Napa County and applied to species that were associated with various wetland types such as Vernal pool fairy shrimp (*Branchinecta lynchi*), Few-flowered navarretia (*Navarretia leucocephala ssp. pauciflora*) and Showy rancheria clover (*Trifolium amoenum*).

Phase 4 - Corridor Connectivity

The connectivity of wild land corridors and how vineyard development might disrupt them was also analyzed. Application of the predicted vineyard expansion model allowed for the identification of corridors in danger of disruption by detecting patterns in fragmentation of species rich areas due to an increase in vineyard development. Visual analysis of corridor disruption allowed for the prioritization of species rich patches (Bender et al., 1998).

Species rich patches that were found to be highly fragmented were the focus of identifying wildlife corridors between such patches. California Department of Fish and Game (CDFG) developed a dataset called “ACE-II biological richness” for ecologic regions within California. The dataset ordinates species rich areas from 1-5 where five is

the most species rich. Six taxonomic groups: birds, fish, amphibians, plants, mammals, and reptiles were evaluated by CDFG for the development of the dataset. Locational information on wetlands, riparian, rare upland natural communities and high value salmonid habitat were also evaluated to determine distribution of species richness and rarity (ACE-II, 2011).

This study combined four GIS spatial datasets from the ACE-II database (Central Coast, Northern Coast, Northern Coast Ranges, and Northern Interior Coast Ranges) in order to obtain a complete species richness dataset for Napa County. GIS analyses of the species richness dataset revealed five areas within the County and are shown in Figure 5. The future vineyard location dataset, developed earlier, was overlaid with the species richness data that represented the five species rich regions. Overlapping areas were removed from the species richness layer resulting in a new fragmented species richness dataset for the County. Next, the United States Geological Survey National Hydrologic dataset was then used to identify all streams that intersected the species richness areas and then buffered 339.5 meters on either side of the stream in order to create potential wildlife corridors between patches (Figure 6). Hilty and Merenlender (2004) found that riparian corridors with a width of 639 meters within vineyard-dominated landscapes are an important element to wildlife movement. In fact, mammalian predators were 11 times more likely to be detected within riparian corridors then vineyards (Helty and Marenlender, 2004). Lastly, visual examination was used to analyze all species richness index values (1-5) within Napa County in order to prioritize areas that would best suit vineyard development with minimal impact to species richness.

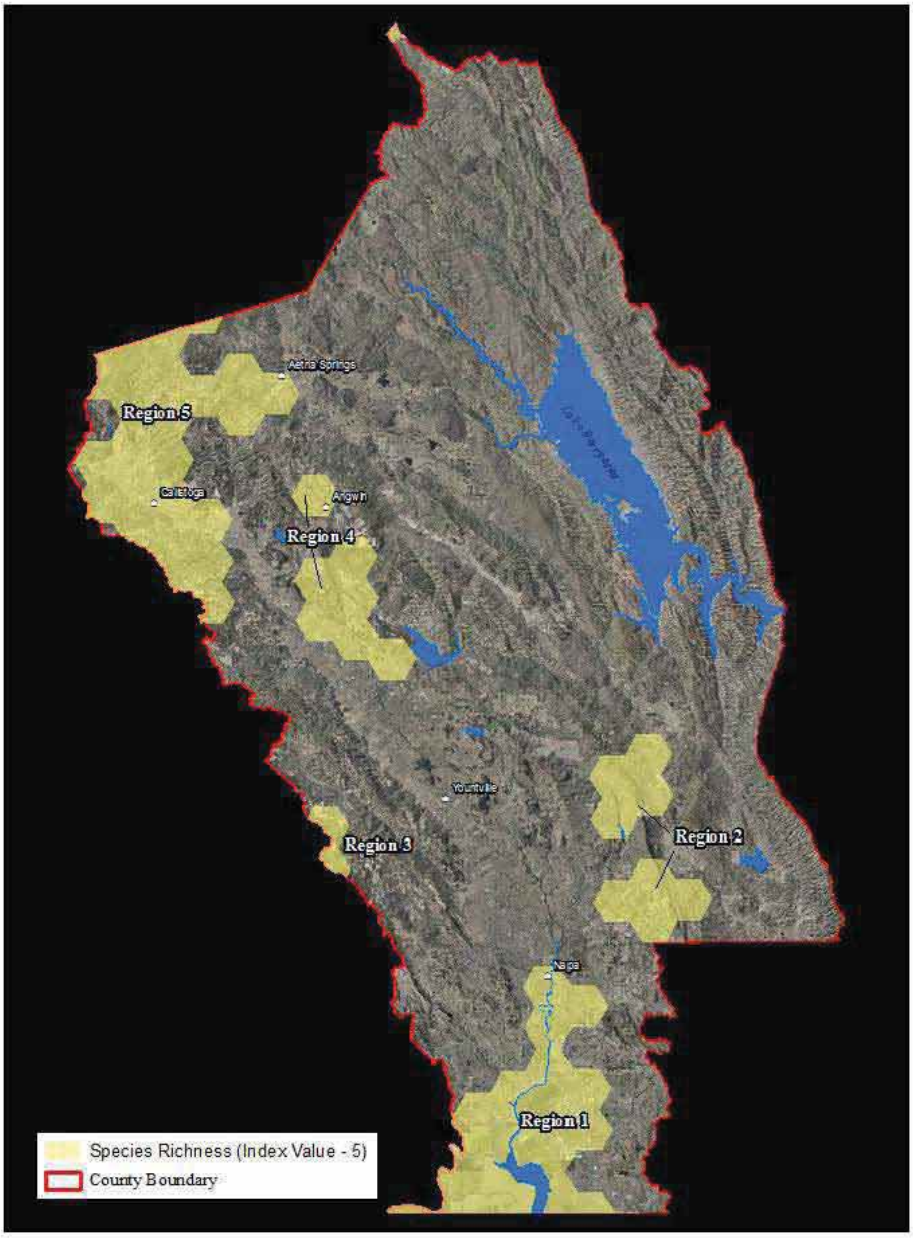


Figure 5. Overview of Five Species Rich Regions within Napa County.

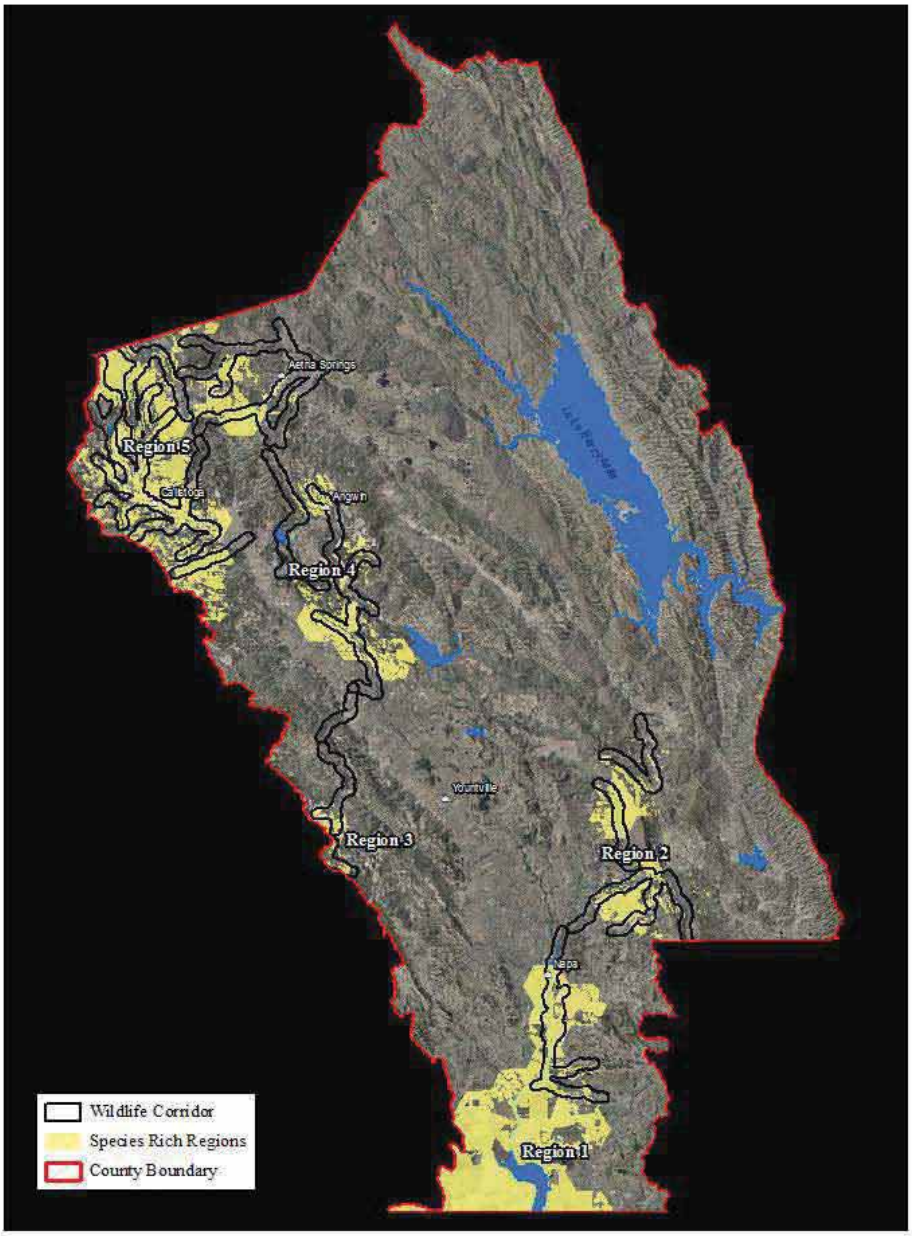


Figure 6. Wildlife Corridors Linking Five Fragmented Species Rich Regions Due to Vineyard Expansion within Napa County.

RESULTS

Vineyard Expansion Model

The first phase of the vineyard expansion model resulted in a digitized existing vineyards dataset, based on aerial image interpretation, of 22,394.55 vineyard hectares that comprised 11% of the total land area within Napa County. Existing vineyards ranged in elevation from 11 meters to over 800 meters. Vineyards that were found below 300 meters accounted for 86% of all existing vineyards. Those occurring above 600 meters, accounted for less than 1 percent. Existing vineyards were more common on the West side of the county and on the valley floor, which runs north to south from the southern edge of Alexander Valley to the marshes in the south. Figure 7 shows the distribution of existing vineyards within the county by elevation.

All of the eleven characteristic datasets that were used as inputs to the future vineyard expansion model were reclassed to a normalized suitability index of 0-10. The results of the reclassification are represented in Table 3 and allowed for the creation of a suitability raster of future vineyard locations. This dataset ordinated all land within the county for vineyard suitability, the index was 27-79. The highest and lowest index values represented less than 0.01 % of the total area combined and the mean index value (53) accounted for 4%. The suitability index from the future vineyard raster dataset showed a normal distribution and is represented in Figure 8.

Overlaying existing vineyards with the suitability raster revealed the final suitability index values used for determining future vineyard locations within the

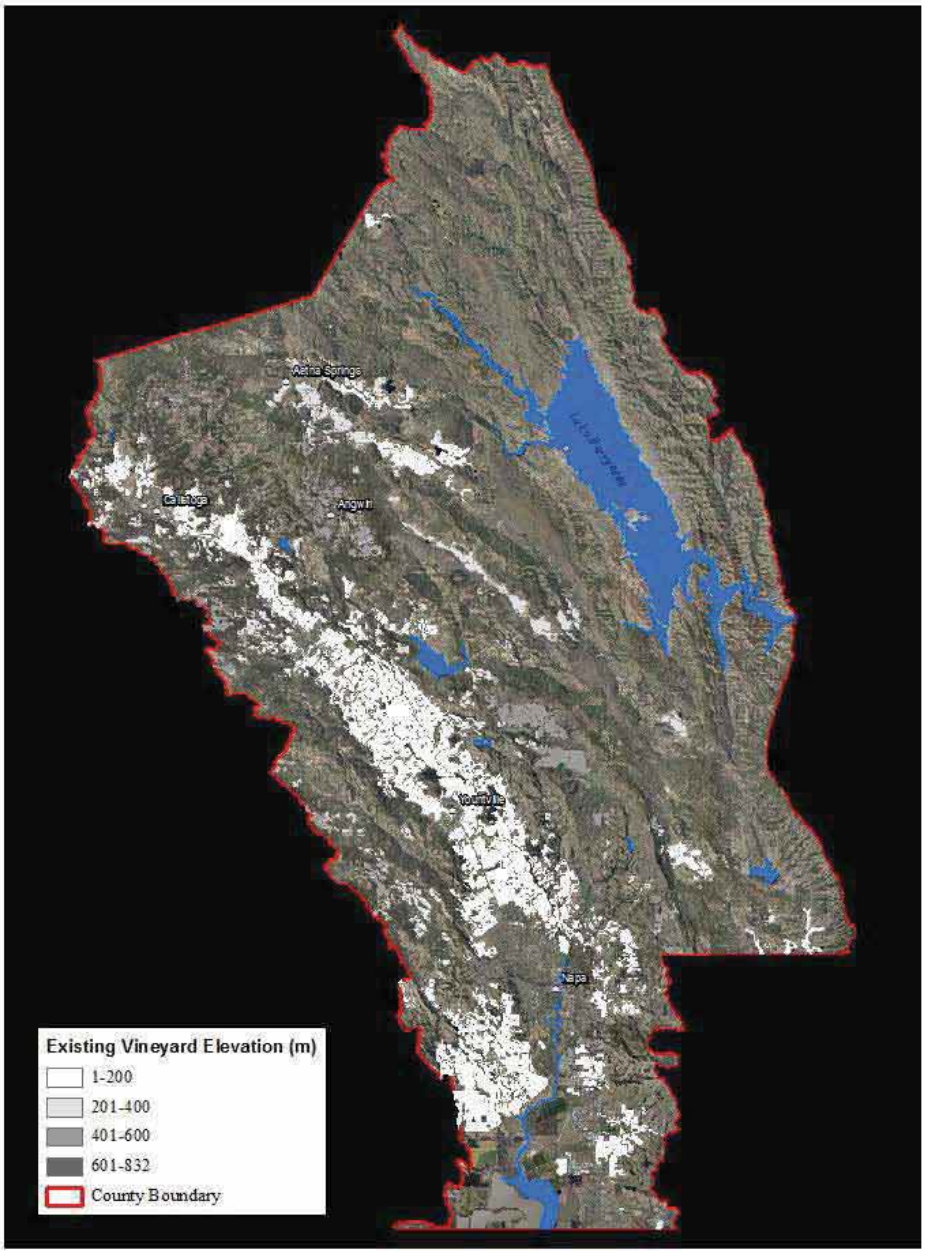


Figure 7. Existing Vineyard Distribution by Elevation throughout Napa County.

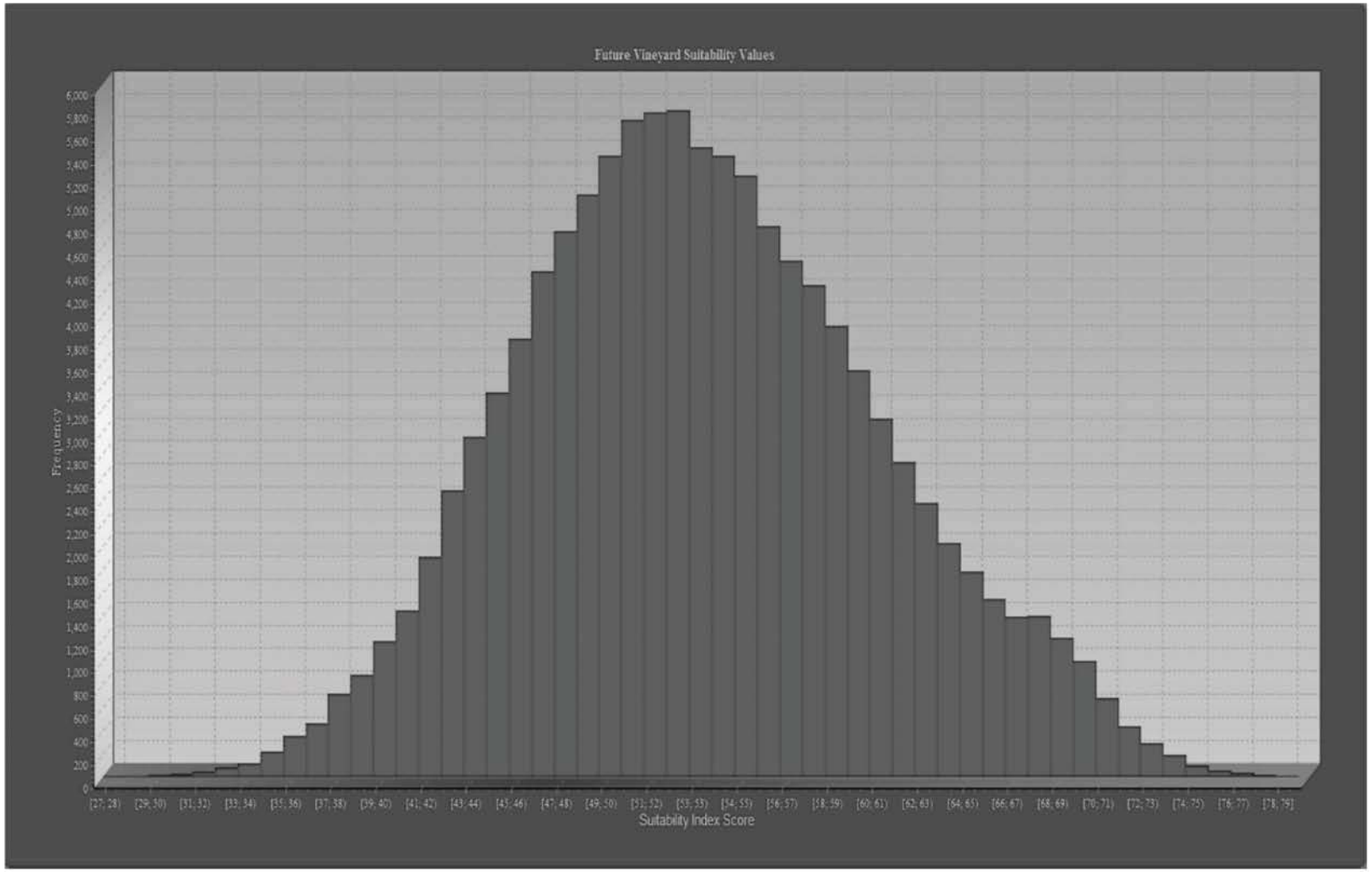


Figure 8. Normal Distribution of the Future Vineyard Suitability Raster Index Values within Napa County.

County. The index ranged from 35-79 and accounted for all future vineyard locations within Napa County. Unavailable lands, which totaled 278,196 hectares and accounted for 55 % of Napa County, were removed from the future vineyard suitability raster resulting in 87,817 hectares of potential future vineyard locations.

Biological Analysis - Phase 4

The ecosystem impact analysis model (Figure 9) revealed nine ecosystems that have the potential to lose over 50% of their total area within Napa County because of future vineyard expansion. California xeric serpentine chaparral showed the largest potential loss at roughly 93%. The least affected vegetative ecosystem was Mediterranean California mesic mixed conifer with just 5.3% of its area affected and shown in Table 6. All thirty individual ecosystems and their potential impacts are represented in Table 5.

A CNDDB search of special status species for Napa County revealed twenty-three species that held special status designations and are potentially impacted by future vineyard expansion (Table 7). The twenty-three species included 1 amphibian, 1 fish, 4 avian, 3 invertebrate, 1 mammal, and 13 plant species. Three of the species, Central California Coast steelhead (*Oncorhynchus mykiss irideus*), California freshwater shrimp (*Syncaris pacifica*) and Swainson's hawk (*Buteo swainsoni*) were not evaluated in this study. Central California Coast steelhead and California freshwater shrimp both are aquatic species and only occur in rivers and perennial streams. As such, future vineyards

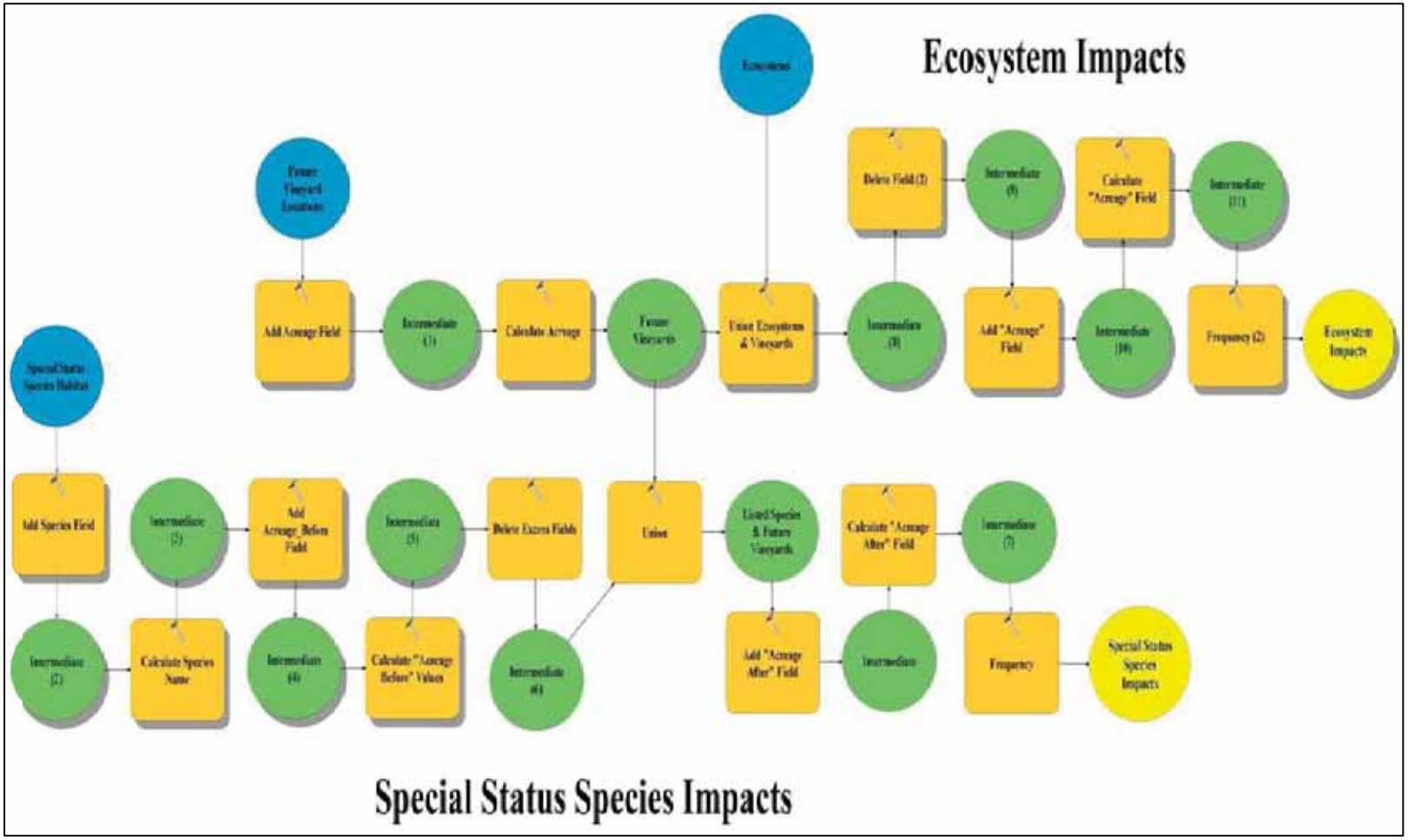


Figure 9. Ecosystem and Special Status Species Impact Model.

Table 6. Ecosystem Percent Loss Due to Vineyard Expansion. California Xeric Serpentine Chaparral showed the greatest loss of area at 93%.

Ecosystem	Percent Loss
Agriculture – General	14
California Annual Grassland	57
California Coastal Live Oak Woodland and Savanna	52
California Coastal Redwood Forest	44
California Lower Montane Blue Oak-Foothill Pine Woodland and Savanna	51
California Mesic Chaparral	55
California Montane Jeffrey Pine-(Ponderosa Pine) Woodland	35
California Montane Woodland and Chaparral	36
California Northern Coastal Grassland	45
California Xeric Serpentine Chaparral	93
Central and Southern California Mixed Evergreen Woodland	45
Developed-Low Intensity	5
Developed-Open Space	9
East Cascades Oak-Ponderosa Pine Forest and Woodland	53
Introduced Upland Vegetation - Perennial Grassland and Forbland	50
Klamath-Siskiyou Cliff and Outcrop	20
Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland	42
Mediterranean California Foothill and Lower Montane Riparian Woodland	62
Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland	45
Mediterranean California Mesic Mixed Conifer Forest and Woodland	5
Mediterranean California Mixed Evergreen Forest	39
Mediterranean California Mixed Oak Woodland	36
Non-Specific Disturbed	16
North Pacific Montane Grassland	45
North Pacific Montane Riparian Woodland and Shrubland	11
North Pacific Oak Woodland	56
Northern and Central California Dry-Mesic Chaparral	40
Northern California Coastal Scrub	62
Open Water	1
Temperate Pacific Tidal Salt and Brackish Marsh	34

Table 7. Special Status Species Impact Analysis Results.

Taxon Group	Species	Modeled Habitat (hectares)	Potential Habitat Loss (hectares)	Remaining Potential Habitat (hectares)	Percent Habitat Loss
Amphibian	California red-legged frog	17,150	4,437	12,713	26%
Fish	Central California Coast steelhead	n/a	n/a	n/a	n/a
Bird	California black rail	802	80	722	10%
	California clapper rail	1,132	140	991	12%
	Bald eagle	57,463	32,612	24,851	57%
	Swainson's Hawk	n/a	n/a	n/a	n/a
	Western snowy plover	2,025	289	1,736	14%
Invertebrate	Vernal pool fairy shrimp	2333	1,011	1,321	43%
	Valley elderberry longhorn beetle	2,918	1,898	1,020	65%
	California freshwater shrimp	n/a	n/a	n/a	n/a
Mammal	Salt-marsh harvest mouse	1,217	225	992	18%
Plants	Soft bird's-beak	1,417	211	1,207	15%
	Contra Costa goldfields	42,423	24,825	17,597	59%
	Keck's checkerbloom	61,751	36,998	24,753	60%
	Mason's lilaeopsis	94.40	59	35	63%
	Calistoga popcorn-flower	3,478	2,283	1,195	66%
	Clara Hunt's milk-vetch	33,365	22,750	10,615	68%
	Showy rancheria clover	17,802	12,186	5,616	68%
	Napa blue grass	6,134	4,293	1,841	70%
	Tiburon paintbrush	643	453	189	71%
	Sebastopol meadowfoam	14,188	10,046	4,142	71%
	Few-flowered navarretia	5	4	1	80%
	Burke's goldfields	544	489	55	90%

will not directly affect these species. The current Swainson's hawk range does not fall within Napa County. Personal communication with wildlife biologists revealed that Swainson's hawk (*Buteo swainsoni*) occurrences within the County are outside the biologic norm for this species and thus not representative of Swainson's hawk distribution (Howe, personal communication; Kohn, personal communication).

Of the remaining twenty CNDDB listed species analyzed, this study found that California red-legged frog, the only amphibian listed as threatened or endangered within Napa County, had 17,150.57 modeled habitat hectares. Twenty-six percent remained after elimination of the potential future vineyard locations.

Out of the three bird species analyzed, 57% habitat loss was associated with the Bald eagle (*Haliaeetus leucocephalus*). The habitat of both of the rail species, California black rail and California clapper rail, were reduced 10% and 12% respectively. Invertebrates lost a combined total of 2,341.41 hectares of habitat with the Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) impacted the most with 65% of its core habitat removed. Salt-marsh harvest mouse (*Reithrodontomys raviventris*) was the fifth lowest impacted species analyzed in this study. Eighteen percent of its core habitat was loss due to vineyard expansion with 225.06 hectares affected.

The botanical species were the most affected group by future vineyard expansion. Of the twelve species studied, eleven experienced habitat loss of 59% or above. Burke's goldfields (*Lasthenia burkei*) had 55 hectares remaining out of 544 hectares of habitat, resulting in a 90% decrease in habitat.

Five core species rich regions were identified from the ACE-II database as being highly fragmented by vineyard expansion (Figure 6). Analyzing the five regions revealed thirty-nine potential corridors linkages. Out of the five regions, Region 1was the least fragmented. Fragmented areas were assessed qualitatively by visual interpretation. Significant fragmentation occurred on the north and east portions of Region 1. Napa River, Suscol Creek, Tulucay Creek, and Miliken Creek were identified as potential wildlife linkages to the fragmented species rich patches within the region. Region 2 had four creeks (Capell Creek, Miliken Creek, Sarco Creek, and White Creek) and five designated linkages as potential wildlife corridors. Capell Creek and Sarco Creek provided connectivity to the most fragmented areas. Regions 3 was the smallest out of the five regions identified. Located on the West side of the county, Bear Canyon Creek, Dry Creek, Montgomery Creek, and Redwood Creek provided connectivity to the species rich region and its associated fragmented areas. Montgomery Creek and Redwood Creek allowed the most connectivity to fragmented sites within the region.

North of Region 2 lies the fourth region. It is highly fragmented within its central and northern boundaries. Portions of the Napa River, Canon Creek and Conn Creek were identified as potential corridors linking Region 4's fragmented patches. Of the three creeks, Conn Creek and Canon Creek provided the most connectivity to the highly fragmented North and Central regions.

The Northwest corner of the Napa County experienced the highest level of fragmentation. In this area, Region 5 exhibited the most corridors of all other regions. Twelve creeks provided linkages within Region five of which half (Blossom Creek,

Cyrus Creek, Napa River, Nash Creek, Saint Helena Creek, and Troutdale Creek) connected the region's most fragmented areas.

Lastly, recommended priority areas within the County for future vineyard development were identified. GIS analysis of the species richness dataset evaluated all richness scores (1-5). The results of the analysis revealed locations for developing future vineyards with the least impacts to species richness and occurred within four areas (Figure 10). Areas surrounding Lake Berryessa and Lake Curry have the largest total area for suitable development; Area 1 had the least. Area 4, lying just to the North of Lake Berryessa showed comparable development potential to Areas 3 and 4; however, Federal and Local Government lands are a limiting factor.

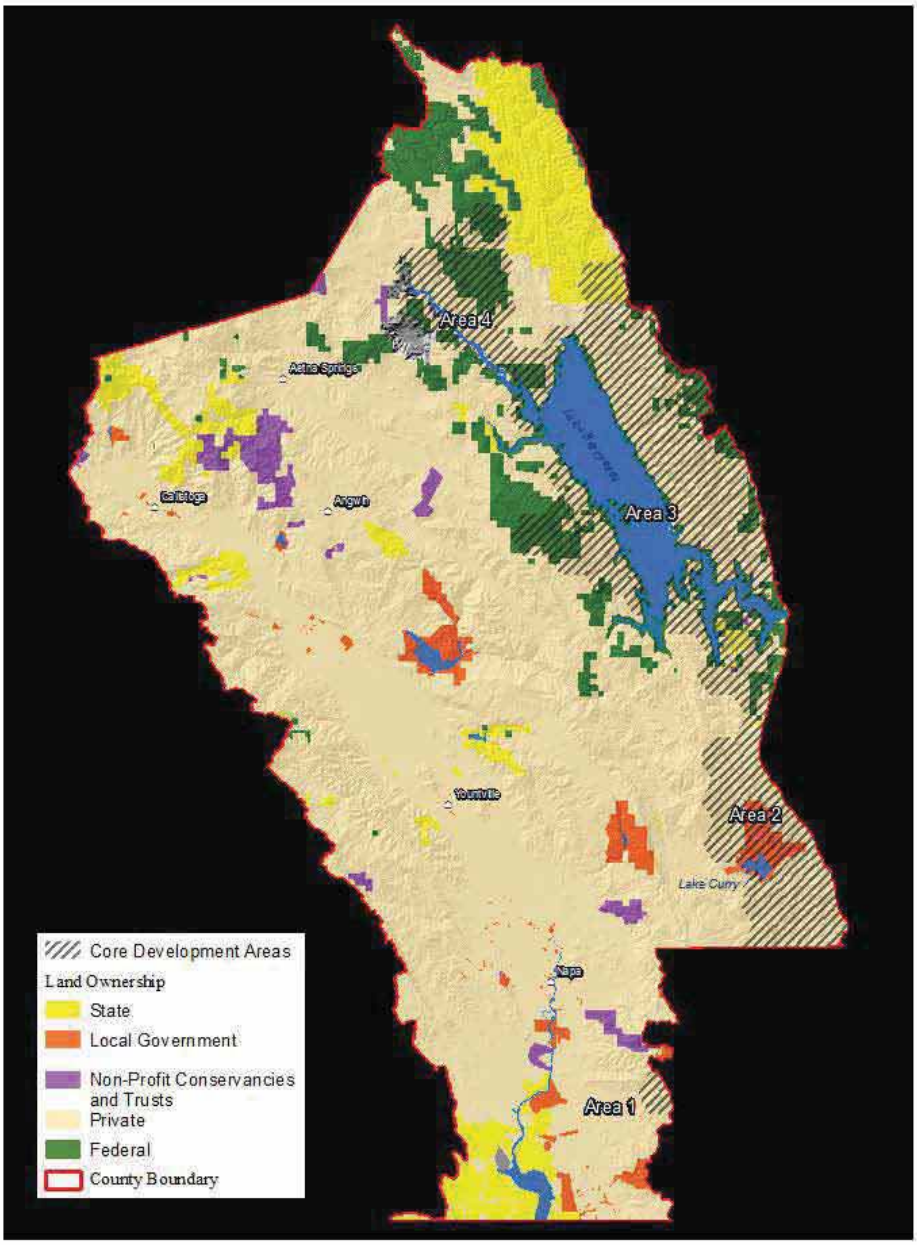


Figure 10. Recommended Priority Areas (1-4) for Future Vineyard Development. Priority areas were chosen based on low species richness within Napa County.

DISCUSSION

The goal of this study was to quantify the effects that viticulture may have on biodiversity within Napa County and to assist in identifying which ecosystems/communities and special status species may benefit the most from conservation efforts. Thirty biological communities, twenty special status species, and species richness throughout Napa County were evaluated using GIS, in order to demonstrate, that ecosystem and habitat loss are among the greatest threats facing the County.

Results from this research mirrored those of another study that found habitat loss, due to increasing agriculture use, as one of the leading factors negatively affecting biodiversity (Wilcove et al., 1998). Wilcove et al. (1998) quantified the extent to which human activities impact imperiled species throughout the United States. The methods used to quantify specific related impacts to imperiled plants and animals came from review of the Federal Register, survey of biologists, and interviews with specialists from particular species groups. Results from their study showed that agriculture activities accounted for 38% of habitat destruction to threatened and endangered species. Similarly, this study found that future agriculture activities, specifically those associated with vineyard development, accounted for 42% habitat loss within Napa County. Therefore, the similar findings from two different studies with dissimilar methodologies lends credit to this research that showed vineyard expansion can significantly contribute to the loss of biological communities and special status species.

Other research has shown that decision support models and GIS analysis methods can be important useful tools for conservation professionals. Crist et al. (2000) developed a decision support model within GIS that evaluated land-use impacts on biodiversity. Land-use specific data was entered into their model along with biodiversity data (species and vegetation data) in order to assess effects on biodiversity. Outputs from their model were able to map important areas for conservation, support environmental documents and suggest mitigation efforts. Another study, conducted by Scott et al. (1993), demonstrated how GAP analysis within a GIS could be applied in order to protect biodiversity. Individual species data along with existing protected area data (i.e. preserves) were used to identify species that had the most potential for loss of habitat and lacked protection by existing preserves. Both of the above studies support the methodology and results of this research. The development of the impact analysis models within this study utilized both land-use (agriculture – vineyards) and biological data (species, and ecosystem data) which allowed for the identification of species and ecosystems that would benefit the most from conservation. The model also identified areas within Napa County that would be beneficial for conserving biodiversity. Both the methodology and results of this study mirrored those of Crist et al. (2000) and Scott et al. (2003) lending credit to the results and recommendations of this study.

Research in the past has typically addressed conservation of biodiversity via a species approach (Franklin, 1993). In contrast, this study used both a species and biological communities approach in order to identify communities and species as important areas for conservation. Such an approach allows a more robust approach to

biodiversity preservation in a regional scale, and is generally more useful to conservation planners (Opdam et al., 2008).

Conservation Recommendations

Napa County has a wide variety of communities that are important for maintaining its highly diverse and specialized biota. The ecosystem impact analysis allowed for the identification of important communities, such as those associated with *Quercus* species, which are considered to be the most diverse communities in California and provide critical habitat for thousands of species (Merenlender, 2000; Pavlik et al., 1991; Reynolds et al., 2007). Communities, which contain *Quercus* species totaled 36,645.56 hectares within the County and represent nearly 20% of the total land. The vineyard expansion model predicted that Oak related communities could be reduced by over 51% if suitable vineyard land is fully developed. Other cascading effects may follow with loss of vegetation cover, soil disturbance, and habitat fragmentation.

Oak woodland communities provide breeding habitat for some 75 species of birds and share a symbiotic relationship with certain avifauna. At least 30 species of birds rely on acorns for food. For example, the Acorn Woodpecker (*Melanerpes formicivora*), Western Scrub-Jay (*Aphelocoma californica*) and the Yellow-billed Magpie (*Pica nuttalli*) all cache acorns in the ground thus actively supporting range expansion for oak communities while benefiting from the food source. (Reynolds et al., 2007)

The oak woodland community and avifauna relationship is just one example of how oak communities play a pivotal role in maintaining biodiversity within Napa County

and are therefore a critical community for future conservation efforts. Though this research evaluated the future effects on special status species it is important to note the conservation implication that many non-special status species will also be threatened due to individual specie dependencies on various affected communities owing to future vineyard expansion.

Serpentine communities are typically a good indicator that highly specialized and rare species may be found nearby (Wolf, 2001). Soils related to serpentine communities have excess metals such as magnesium and lack specific nutrients that most plant species require. Because of these characteristics, only a select few species have been able to adapt to this nutrient deficient system. This ability for adaptation to such restrictive environments has allowed for high endemism within California and particularly Napa County (Green et al., 2003). There was one serpentine related ecosystem (California xeric serpentine chaparral) identified in this study and only 4.23 hectares currently exist within the County. Results from the analysis revealed that this highly specialized ecosystem could potentially lose approximately 93% of its total area due to vineyard expansion. Because this ecosystem has a high probability for containing rare and endemic plant species, management efforts at preservation should be undertaken.

Riparian ecosystems have unique vegetative communities and fauna (Knopf et al., 1988). Riparian vegetation attracts a larger portion of migratory insect eating avifauna then do surrounding upland locations; therefore, these riparian ecosystems play an important role in maintaining avifauna diversity (Knopf et al., 1988). Two riparian ecosystems exist in the study area. The *Mediterranean California foothill and lower*

montane riparian woodland and *North pacific montane riparian woodland and shrubland* together represented 1,928.33 hectares within the county. Results from this impact analysis reveal that 62% of the total area covered by the two ecosystems could potentially be removed by vineyard development. Riparian ecosystem protection should therefore be a priority within the County.

Aside from serpentine, the most affected ecosystems were grasslands. Specialized habitat such as vernal pools and wetlands are often associated with these ecosystems (Gerhardt and Collinge, 2003; Keeley and Zedler, 1998; Marty, 2005). Such unique systems support many endemic and specialized biota found throughout California. Out of the four grassland ecosystems studied, California annual grassland showed the largest reduction (57%) after potential future vineyards were applied to the impact analysis. All grassland related ecosystems combined, show a 55% decrease.

Federal and State listed species are identified as those that are on the brink of extinction or will likely become extinct in the near future (U.S. Fish and Wildlife Service, 2003; Ca. Department of Fish and Game, 2012). This study identified twenty-four listed species of six taxonomic groups within Napa County. Through GIS analysis, the distribution of each species habitat was mapped to calculate potential direct impacts due to future vineyard expansion. Of the six taxonomic groups, plants exhibited the most potential for being affected by future vineyards, followed by invertebrates, birds, amphibians, and then mammals. The impact analysis results for plants showed that eleven out of the twelve species should be considered for habitat conservation efforts. Priorities for the twelve species should be evaluated based on the total remaining habitat

for a particular species and the percentage of habitat loss taken into consideration. Burkes goldfields (*Lasthenia burkei*), Few-flowered navarretia (*Navarretia leucocephala ssp. pauciflora*), Tiburon paintbrush (*Castilleja affinis ssp. neglecta*), Mason's lilaeopsis (*Lilaeopsis masonii*) and Calistoga popcorn-flower (*Plagiobothrys strictus*) are the top five species that are recommended for prioritizing habitat conservation efforts.

The results of the study indicate a potential significant decrease in habitat for invertebrates. However, the Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus)* has been proposed for delisting, so this species may not be an issue (U.S. Fish and Wildlife Service, 2011). The U.S. Fish and Wildlife Service should be consulted for the current status.

Both species of rails, California black rail (*Laterallus jamaicensis coturniculus*) and California clapper rail (*Rallus longirostris obsoletus*), showed the least effects due to vineyard expansion of all the species analyzed. This is due to their affinity for salt, brackish and freshwater marshes that occur in the southern most portion of the County. However, habitat for the Bald Eagle (*Haliaeetus leucocephalus*), which comprises both foraging and breeding habitat was reduced nearly 60% by potential vineyard expansion.

The only amphibian analyzed in this study was the California red-legged frog (*Rana draytonii*). Though this species is federally listed, it is somewhat of a generalist when it comes to aquatic habitats. This species can occur in permanent or nearly permanent pools, intermittent streams, marshes, and ponds (Stebbins, 1985). The California red-legged frog may be the least affected by vineyard expansion due to its

generalist nature and the fact that habitat for this species (i.e. ponds) is often created when vineyards are developed (Napa County, 2012).

Similar to the species of rails, the Salt-marsh harvest mouse (*Reithrodontomys raviventris*) habitat has minimal characteristics in common with vineyard development sites. As the name implies, its habitat requirements are those of salt marshes. This analysis predicted a potential loss of 225.00 hectares to the species, a loss of 18%.

Reduction of species rich areas within the County resulted in the noticeable disruption of potential wildlife corridors. The Northwest corner of Napa County experienced the highest rate of fragmentation. Corridor identification in this analysis used riparian zones to link fragmented areas, because they typically are major routes of wildlife movement between patches. The purpose of this GIS study was not to come up with "tried and true" corridors, as this requires a great deal of research and field verification. Instead, it was intended to provide reconnaissance level identification of corridor locations within Napa County for natural resource experts and conservation planners. Therefore, each corridor identified in this study needs to be evaluated in order to determine 5 critical features of a wildlife corridor. In general, corridors should provide ways for; 1) wide-ranging animals to migrate and meet mates, 2) plants to propagate, 3) genetic gene flow, 4) "populations to disperse due to environmental changes and natural disasters", and 5) "individuals to recolonize habitats from which populations have been locally extirpated." (Beier and Loe, 1992)

Species rich areas identified to be highly fragmented within the County should be further studied in order to determine the extent at which edge effects may be present. For

each fragmented area, recommended studies should include looking at potential consequences of abiotic effects, direct biological effects, and indirect biological effects. For example, how will abiotic effects such as pesticide use along the edges/borders of vineyards and the species rich fragmented areas affect edge species and communities? To what extent will direct biological effects such as shifts in species composition due to vineyard expansion occur along their edges? To what extent will indirect biological effects occur resulting in cascade effects across ecosystems due to species interactions? For example, a change in the vegetation along edges of the species rich fragmented areas may increase the abundance of herbivorous insects resulting in the attraction of nesting birds. An influx of nests could cause a rise in nest predators that could potentially introduce parasites that spread across edge ecosystems. This “cause and effect” species type interaction could ultimately result in negatively reshaping ecosystems along the edges of fragmented species rich patches throughout the County. (Murcia, 1995)

GIS desktop analysis of species rich areas throughout Napa County revealed that future vineyard expansion clearly has an effect on biodiversity depending on where future vineyards are located. Regions around Lake Berryessa and Lake Curry offer the best locations for vineyard development that has minimal impact to species richness within Napa County (Figure 10). Focusing vineyard development within these areas can mitigate the rate of impacts to species rich areas by allowing time for the development of a comprehensive strategy for the creation of conservation areas within the County. This is important due to a multitude of constraints that face conservation/reserve design. Constraints such as funding for private land acquisition and future management of the

conservation areas are two of the biggest hurdles that face reserve design and implementation. Such constraints can take years of planning before implementation can occur (Margules and Pressey, 2000).

Analysis Considerations

The vineyard expansion model developed in this research was created using a multitude of datasets. A general rule concerning GIS analysis is that results are only as accurate as the data used. A minimum mapping unit of 1 hectare has been acknowledged within the literature as an acceptable mapping unit for countywide analysis (Merenlender, 1999). However, a more fine-tuned output of the vineyard expansion model would result if a smaller mapping unit were chosen.

The creation of the exiting vineyards dataset revealed that vineyards are often planted within areas that are 0.405 hectares in size. Therefore, it is recommended that for future considerations a minimum mapping unit equal to or less than 0.405 hectares be used. A mapping unit of this size would allow for a better representation of future vineyard locations and ultimately strengthen the impact analyses for both the ecosystems and special status species.

Reducing the mapping unit size however, will limit the availability of necessary datasets for analysis. Because most publicly available data is often created by State or Federal agencies, their jurisdictional study areas are much larger than that of local governments. Larger study areas result in larger datasets, which increases the cost of data collection, therefore mapping units larger than 0.405 hectares are commonly used. To

mitigate for this data limitation it is recommended that future research efforts be conducted in conjunction with Napa County or other local governments if used for supplementary geographic areas. This symbiotic interaction between researcher and government entity may allow for the use of data not normally available to the public.

An important dataset used for the special status species impact analysis was the CAIN vegetation dataset. This dataset was used extensively for determining species habitat. However, the CAIN vegetation dataset did not include vernal pool data which was required for determining Vernal pool fairy shrimp (*Branchinecta lynchi*), Burke's goldfields (*Lasthenia burkei*), Calistoga popcorn-flower (*Plagiobothrys strictus*), Contra Costa goldfields (*Lasthenia conjugens*), and Sebastopol meadowfoam (*Limnanthes vinculans*). The National Wetland Inventory dataset was evaluated for vernal pool data as well however detailed vernal pool data did not occur within the dataset. Therefore, vernal pool data for Napa County was modeled within GIS. The results from the analysis may over or under represent potential vernal pools within the County and ultimately the 5 species habitat mentioned above.

Field verification (i.e. habitat surveys) for the vernal pool related species and ultimately all special status species habitat used within the impact analysis should be conducted in order to improve each species habitat dataset and ultimately impact results for each species. However, land ownership within Napa County may limit the accessibility of land for survey efforts. Private land ownership comprises 77% of all land within the County. Obtaining access to privately owned land may be a limiting factor for survey opportunities and for fine-tuning species impact results.

CONCLUSION

Within Napa County, ecosystems and special status species are facing increasing anthropogenic pressures by way of viticulture expansion. To my knowledge, this study was the first to quantify, at both the ecosystem and species level, potential impacts that vineyard expansion can have on biodiversity within Napa County through GIS analysis.

The study demonstrated that special status species will be significantly threatened by viticulture unless steps are taken to mitigate this threat. Conservation planners and managers must identify strategies that allow for vineyard growth while protecting Napa Counties ecosystems and special status species. It is with hope that Napa County confronts this problem head-on in order to conserve its rich biodiversity while maintaining its historic viticulture past.

Appendix A

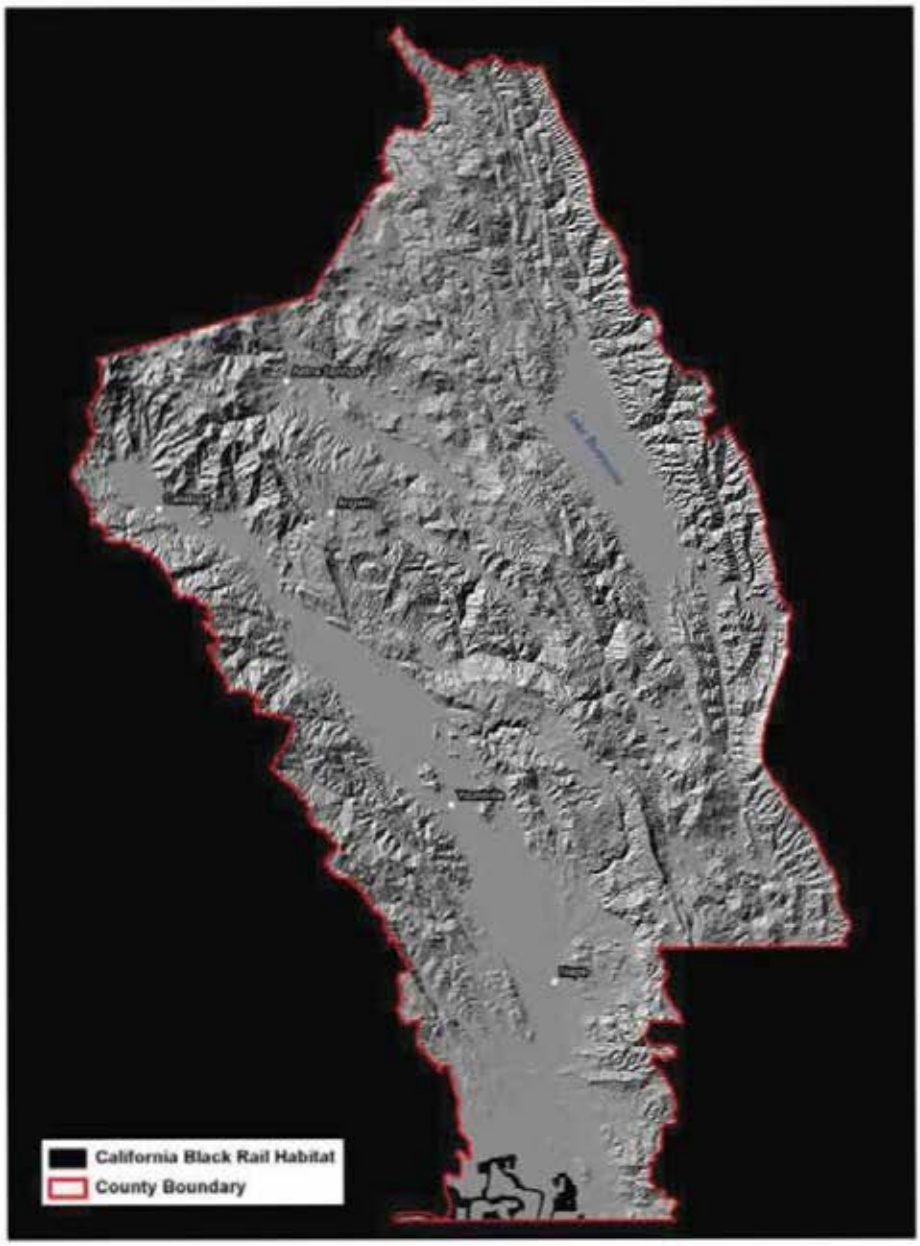
Special Status Species Habitat

Taxon Group	Species	Vegetation/Habitat/Elevation (m)	Reference
Amphibian	California red-legged frog	Permanent pools of streams, marshes, and ponds.	(CWHR, 2011)
Bird	Bald eagle	Cottonwood, Douglas-fir, ponderosa pine, sugar pine, foothill pines, lodgepole pine, oaks, eucalyptus, rock outcrops, Grasslands (foraging near water)	(Jackman and Jenkins, 2004)
	California black rail	Marshes, pickleweed, salt-flats	(CWHR, 2011)
	California clapper rail	Marshes, pickleweed, salt-flats	(CWHR, 2011)
	Swainson's hawk	n/a	n/a
	Western snowy plover	Salt marshes	(USFWS, 2007)
Fish	Steelhead - Central California Coast DPS	n/a	n/a
Invertebrate	California freshwater shrimp	n/a	n/a
	Valley elderberry longhorn beetle	Riparian Forest	(CWHR, 2011)
	Vernal pool fairy shrimp	Vernal Pools, ponds,seasonal Wetland	(CWHR, 2011)
Mammal	Salt-marsh harvest mouse	Pickleweed	(CWHR, 2011)

Taxon Group	Species	Vegetation/Habitat/Elevation (m)	Reference
Plant	Burke's goldfields	Vernal pools, meadows and seeps, swales, (15 - 600m)	(CNPS, 2012)
	Calistoga popcorn-flower	Springs, meadows, wetlands, Vernal Pools (90 - 160m)	(CNPS, 2012)
	Clara Hunt's milk-vetch	Serpentinite, chaparral, cismontane woodland, valley & foothill grassland, (75-275m)	(CNPS, 2012)
	Contra Costa goldfields	Cismontane woodland, Valley and foothill grassland, Vernal pools and wet meadows; (0–470 m)	(CNPS, 2012)
	Few-flowered navarretia	Occurs almost always under natural conditions in wetlands (V.P), (400-855m)	(CNPS, 2012)
	Keck's checkerbloom	Valley Grassland, Foothill Woodland, (75 - 650m)	(CNPS, 2012)
	Mason's lilaeopsis	Marshes and swamps (brackish or freshwater), (0 to 30m)	(CNPS, 2012)
	Napa blue grass	Valley Grassland, wetland-riparian, wetlands, (100-200m)	(CNPS, 2012)
	Sebastopol meadowfoam	Center and edge of vernal pools (0-300 m)	(CNPS, 2012)
	Showy rancheria clover	Valley Grassland, wetland-riparian, Affinity to serpentine soil, Coastal bluff scrub, valley and foothill grassland (sometimes serpentine), (5 - 415m)	(CNPS, 2012)
	Soft bird's-beak	Marshes / 0-3 meters	(CNPS, 2012)
	Tiburon paintbrush	Bunch grass communities, Serpentine grasslands (serpentine bunchgrass communities), (60-400m)	(CNPS, 2012)

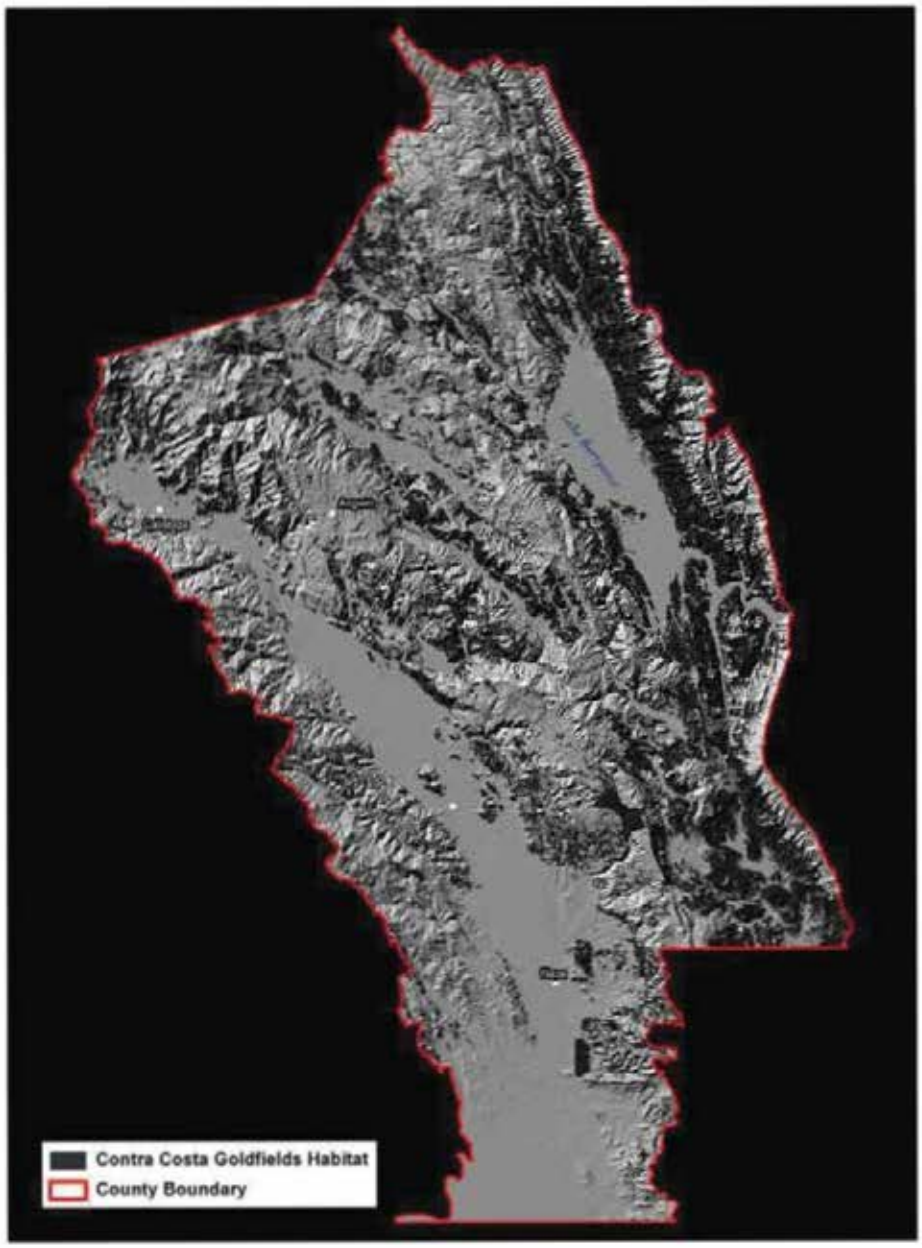
APPENDIX B

Species Habitat Distribution Maps


California Black Rail Habitat
County Boundary

California Clapper Rail
County Boundary

Clara Hunt's milk-vetch
County Boundary

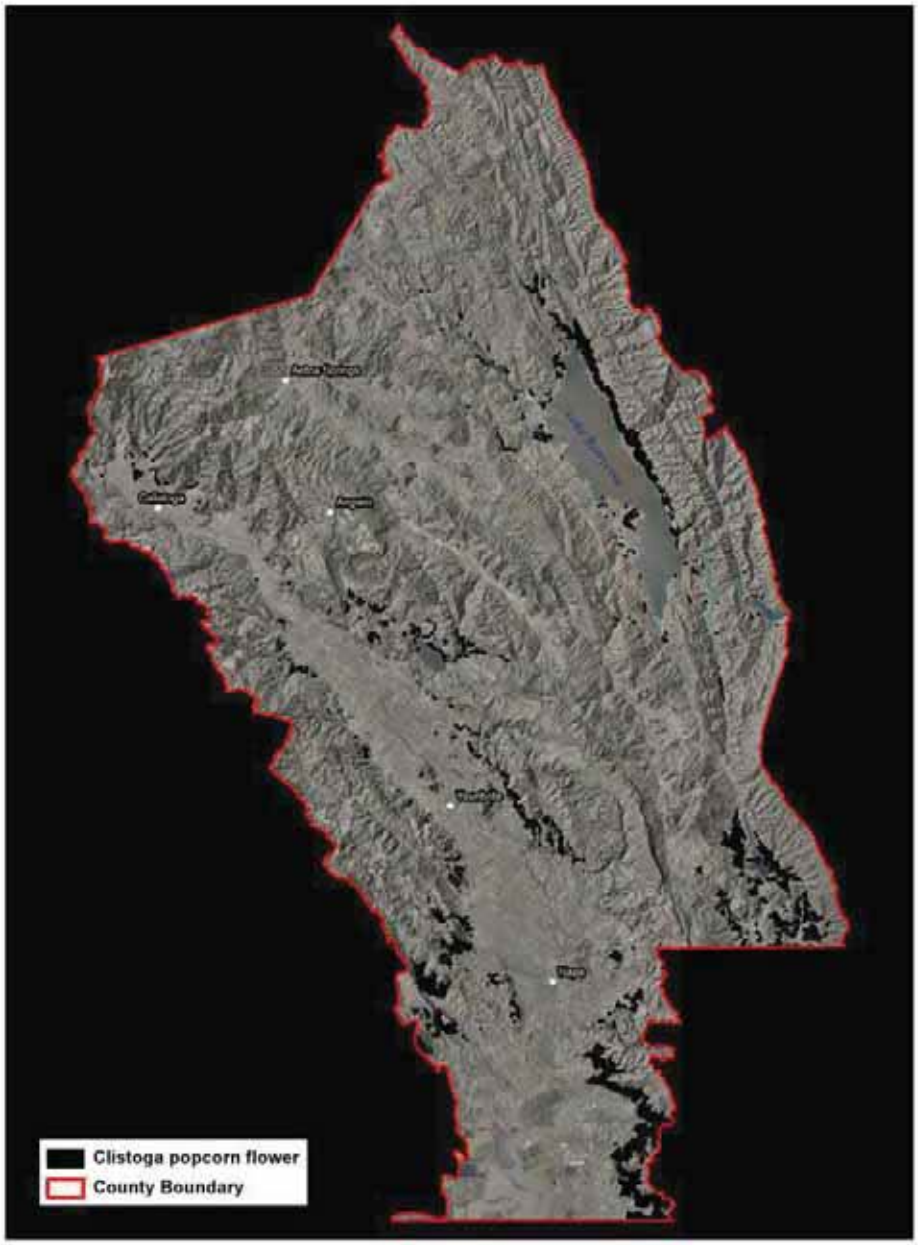

Contra Costa Goldfields Habitat
County Boundary

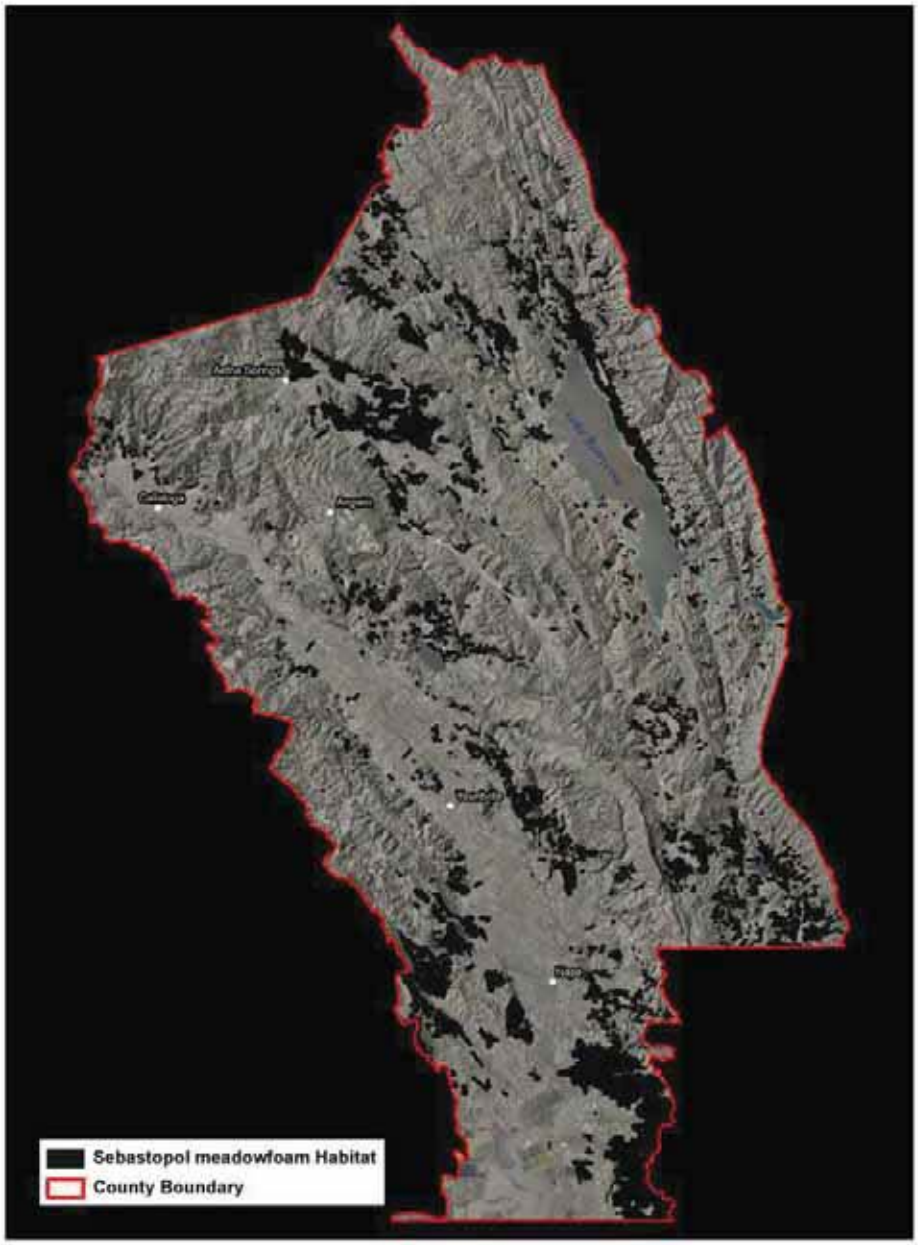
Few-flowered navarretia Habitat
County Boundary

Keck's checkerbloom Habitat
County Boundary

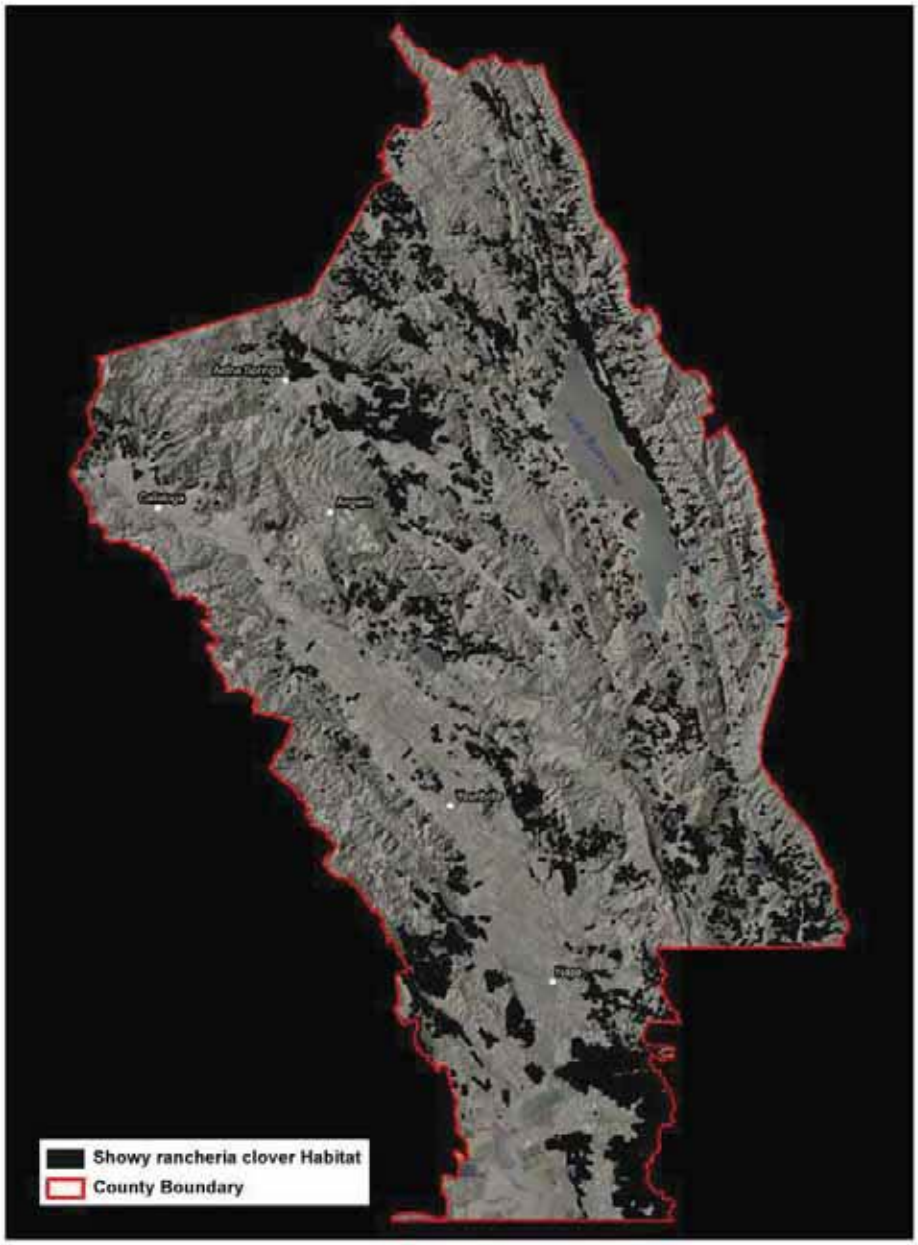
Mason's lilaeopsis Habitat
County Boundary

Napa blue grass Habitat
County Boundary


Clistoga popcorn flower
County Boundary


Sebastopol meadowfoam Habitat
County Boundary

Salt-marsh harvest mouse Habitat
County Boundary


Showy rancheria clover Habitat
County Boundary

Soft bird's-beak Habitat
County Boundary

Tiburon paintbrush Habitat
County Boundary

Valley elderberry longhorn beetle Habitat
County Boundary

Vernal pool ferry shrimp Habitat
County Boundary

Western snowy plover Habitat
County Boundary

LITERATURE CITED

Abbitt R. J. F., J. M. Scott, and D. S. Wilcove 2000. The Geography of Vulnerability: Incorporating Species Geography and Human Development Patterns into Conservation Planning. Biological Conservation 96: 169-175.

Bender D.J., T.A. Contreras, and L. Fahrig 1998. Habitat Loss and Population Decline: A Meta-Analysis of the Patch Size Effect. Ecology 79: 517–533.

California Department of Fish and Game (CDFG). CWHR Life History and Range Maps. California Department of Fish and Game. Sacramento, Ca. <http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx> November 11 2011.

California Department of Fish and Game (CDFG) California Endangered Species Act (CESA) California Department of Fish and Game. Sacramento, Ca. <http://www.dfg.ca.gov/habcon/cesa/incidental/cesa_policy_law.html> June 12, 2012.

Calsbeek, R., J. Thompson, and J.E. Richardson. 2003. Patterns of Molecular Evolution and Diversification in a Biodiversity Hotspot: the California Floristic Province. Molecular Ecology 12:1021-1029.

California Native Plant Society (CNPS). Inventory of Rare and Endangered Plants (online edition). California Native Plant Society. Sacramento, CA. <http://cnps.org/> 2012.

Chaplin, S. J., R. A. Gerrard, H. M. Watson, L. L. Master and S. R. Flack. 2000. The Geography of Imperilment, Targeting Conservation Toward Critical Biodiversity Areas. Pp. 159-199, in B. A. Stein, L. S. Kutner, J. S. Adams (eds.) Precious Heritage, The Status of Biodiversity in the United States, Oxford University Press, New York, NY.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow and J. Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, Virginia.

Crist, P. J., T. W. Kohley and J. Oakleaf. 2000. Assessing Land-use Impacts on Biodiversity Using an Expert Systems Tool. Landscape Ecology 15:47-62.

Danika C. T., J. Y. Takekawa, Isa Woo, J. L. Yee, and J. G. Evens. 2009. Home Range, Habitat Selection, and Movements of California Black Rails at Tidal Marshes at San Francisco Bay, California. The Condor 111: 599-610.

Eddleman, W. R., R. E. Flores and M. L. Legare. 1994. Black Rail (*Laterallus jamaicensis*). In The Birds of North America, No. 123 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Erickson, W. P., T. L. McDonald and R. Skinner. 1998. Habitat Selection Using GIS Data: A Case Study. Journal of Agricultural, Biological,and Environmental Statistics 3:296-310.

Franklin A. B., B. R. Noon and L. George. 2002. What is Habitat Fragmentation? Studies in Avian Biology 25: 20-29.

Gerhardt, F., and S. K. Collinge. 2003. Exotic Plant Invasions of Vernal Pools in the Central Valley of California, USA. Journal of Biogeography 30:1043–1052.

Green, J.L., J. Harte, and A. Ostling. 2003. Species Richness, Endemism and Abundance Patterns: Tests of Two Fractal Models in a Serpentine Grassland. Ecology Letters 6: 919–928.

Heaton, E., and A. M. Merenlender. 2000. Modeling Vineyard Expansion, Potential Habitat Fragmentation. California Agriculture 54: 12–19.

Hobson, W.A. and R.A. Dahlgren, 1998. Soil Forming Processes in Vernal Pools of Northern California, Chico Area. In: Ecology, Conservation, and Management of Vernal Pool Ecosystems, C.W. Witham, E.T. Bauder, D. Belk, W.R. Ferren, Jr, and R. Ornduf (eds). California Native Plant Society, Sacramento, California. pp. 24-37.

Howe, John. Personal Interview. 14 October. 2011.

Jackman, R.E. and J.M. Jenkins. 2004. Protocol for Evaluating Bald Eagle Habitat and Populations in California. U.S. Fish and Wildlife Service, Sacramento.

Jones, G. V. and Hellman, E. Site Assessment: in Oregon Viticulture Hellman, E. (ed.), 5th Edition, Oregon State University Press, Corvallis, Oregon. pp. 44–50.

Jones, G.V., N. Snead, and P. Nelson. 2004, Geology and Wine 8: Modeling Viticultural Landscapes: A GIS Analysis of the Terroir Potential in the Umpqua Valley of Oregon. Geoscience Canada 31: 167-178.

Keeley, J. E., and P. H. Zedler. 1998. Characterization and Global Distribution of Vernal Pools. p. 1–14. In Carol C. Witham (ed.) Vernal Pool Ecosystems. California Native Plant Society, Sacramento, California. pp. 1-14.

Knopf F.L., Johnson R.R., Rich T, Samson F.B., Szaro R.C. 1988. Conservation of Riparian Ecosystems in the United States. Wilson Bulletin 100: 272–84.

Kohn, William. Personal Interview. 23 October. 2011.

Kurtural, S.K., I.E. Dami, and B.H. Taylor. 2006. Utilizing GIS Technologies in Selection of Suitable Vineyard Sites. International Journal of Fruit Science 6: 87–107.

Hilty, J.A. and A. M. Merenlender. 2004. Use of Riparian Corridors and Vineyards by Mammalian Predators in Northern California. Conservation Biology 18: 126–135.

Margules, C. R., and R. L. Pressey. 2000. Systematic Conservation Planning. Nature 405: 243–253.

Marty, J. 2005. Effects of Cattle Grazing on Diversity in Ephemeral Wetlands. Conservation Biology 19: 1626–1632.

Merenlender, Adina (1999), “A Spatially Explicit Vineyard Expansion Model: Addressing Crop Production, Public Policy, and Environmental Concerns,” University of California Sustainable Agriculture Research and Education Program, Final Report, September 1999. www.sarep.ucdavis.edu/grants/Reports/Merenlender/merenlender96-47.htm.

Merenlender, Adina M. 2000. Mapping Vineyard Expansion Provides Information on Agriculture and the Environment. California Agriculture 54: 7-12.

MKF Research. Report. Economic Impact of Wine and Vineyards in Napa County, 2005

Murcia, C. 1995. Edge Effects in Fragmented Forests: Implications for Conservation. Trends in Ecology and Evolution 10: 58–62.

Myers, N. 1988. Threatened Biotas: “Hotspots” in Tropical Forests. Environmentalist 8: 1-20.

Myers, N. 1990. The Biodiversity Challenge: Expanded Hot-Spots Analysis. Environmentalist 10: 243-256.

Myers, N., R. A. Mittermeier, C. G. Mittermeier, G. A. B. da Fonseca, and J. Kent. 2000. Biodiversity Hotspots for Conservation Priorities. Nature 403: 853-858.

Naesset, E. 1997. Geographical Information Systems in Long-Term Forest Management and Planning with Special Reference to Preservation of Biological Diversity: A Review. Forestry Ecology and Management 93: 121-136.

Napa County. “Napa County General Plan – Conservation Element.” Napa County, n.d. 6 June. 2011. <http://www.countyofnapa.org/GeneralPlan.htm>.

Napa County. “Wastewater Pond MOU – Updated Memorandum of Understanding Regarding Winery Process Waste Treatment and Disposal Between California Regional Water Quality Control Board San Francisco Bay Region and County of Napa.” Napa County, n.d. 1 March. 2012. < http://www.countyofnapa.org/Pages/DepartmentDocuments.aspx?id=4294967420 >.

Napa County Resource Conservation District. “Threatened & Endangered Listed Species of Napa County.” Napa RCD, n.d. 13 Dec. 2007. <http://www.naparcd.org/threatenedendangered.htm>.

Opdam P, R. Pouwels, S. Van Rooij, E. Steingro, and C. C. Vos. 2008. Setting Biodiversity Targets in Participatory Landscape Planning: Introducing the Ecoprofile Approach. Ecology Society 13:20.

Opperman, J.J., K. A. Lohse, C. Brooks, N. M. Kelly, and A. M. Merenlender. 2005. Influence of Land Use on Fine Sediment in Salmonid Spawning Gravels within the Russian River Basin, California. Canadian Journal of Fisheries and Aquatic Sciences 62: 2740–2751.

Osborn, F.V. and G.E. Parker. 2003. Linking Two Elephant Refuges with a Corridor in the Communal Lands of Zimbabwe. African Journal of Ecology 41: 68–74.

Parisi, M. (ed.) 2003. Atlas of the Biodiversity of California. California Department of Fish and Game, Sacramento, CA.

Pavlik, B.R., P. C. Muick, S. G. Johnson, and M. Popper. 1991. Oaks of California. Cachuma Press, Los Olivos, CA, p. 184.

Reynolds, M.; T. Gardali, R. Hirsch-Jacobsen, A. Armstrong. 2007. Reproductive Success of Oak Woodland Birds in Sonoma and Napa Counties. Proceedings of the 6th California Oak Symposium: Today's challenges, Tomorrow's opportunities; 2006 October 9-12; Rohnert Park, California. United States Forest Service General Technical Report PSW-GTR-217 433-445.

Salem, B. B. 2001. Application of GIS to biodiversity monitoring. Journal of Arid Environment 54: 91-114.

Smith, D. W., and W. L. Verrill. 1996. Vernal pool-soil-landform relationships in the Central Valley, California. Proceedings of Ecology, Conservation, and Management of Vernal Pool Ecosystems, 19–21 June 1996. Sacramento, California.

Stebbins, R. C. 1985. A Field Guide to Western Reptiles and Amphibians. 2nd ed., revised. Houghton Mifflin, Boston. 336p.

Stein, B. A., L. S. Kutner, and J. S. Adams. 2000. Precious Heritage: The Status of Biodiversity in the United States. The Nature Conservancy and Association for Biodiversity Information. Oxford University Press, Inc. New York, NewYork.

Steiner, David. Email to the Author. 19 March. 2012. Email.

Seguin, G. 1986. Terroirs and Pedology of Vine Growing. Experientia 42: 861-73.

United States. Fish and Wildlife Service. Region 3: What is the Difference Between Endangered and Threatened. March. 2003. Web. 6 April. 2012. <http://www.fws.gov/midwest/wolf/esastatus/t-vs-e.pdf>.

United States. Fish and Wildlife Service. Pacific Southwest Region: Service to Consider Delisting of Valley Elderberry Lonhorn Beetle. Aug. 2012. Web. 12 Jan. 2012. <http://www.fws.gov/cno/press/release.cfm?rid=254>.

U.S. Fish and Wildlife Service (USFWS). 2007. Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (Charadrius alexandrines nivosus). Sacramento, California.

Wolf, A. 2001. Conservation of Endemic Plants in Serpentine Landscapes. Biological Conservation 100: 35-44.

Wolf, T.K. and J.D. Boyer. 2003. Vineyard Site Selection. Virginia Polytechnic Institute and State University, Blacksburg. Publ. No. 463–020. 10 August 2011. <http://www.ext.vt.edu/pubs/viticulture/463-020/463-020.html>.

Wilcove, D. S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying Threats to Imperiled Species in the United States. Bioscience 48: 607–615.

Zack S., M. K. Chase, and G. R. Geupel. 2002. The Oak Woodland Bird Conservation Plan: A Strategy for Protecting and Managing Oak Woodland Habitats and Associated Birds in California. USDA Forest Service General Technical Report PSW-GTR 184: 845–846.

Comment Letter A7

October 3, 2015

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Re: Comments on Timber Conversion Plan, Timber Harvest Plan and DEIR for Friesen Vineyard Project

Dear Ms. Markham and Mr. Solinsky,

As the chairman of Save Rural Angwin, I wish to submit the following comments for our organization. We represent the voice of the citizens that reside in Angwin and are concerned about the lack of adequacy of the DEIR in many areas. Based on our review and that of Quercus Group, the City of St. Helena, Mr. David Graves and the Land Trust of Napa, we submit that the DEIR, THP, and TCP violate many requirements of CEQA and the Forest Practice Act. The most fundamental flaw is their failure to recognize the significance of the location for this project. It is in one of the most biologically diverse areas in California, is surrounded by 12,000 open acres of open space, is next door to the Dunn Wildlake Preserve (3,000 acres) and is in the watershed for the City of St. Helena. Additionally, no mitigations for GHG conversions is possible at this project and the assertion that this clear cut of timber is in a predominantly agricultural area. This is not the fact. Clearly the documents submitted by Davis, are insufficient to protect the Forest Practice Rules, which state that THP's must evaluate alternatives to a project and its cumulative impact. This also is not done. A7-01

As referenced in Quercus Group's September 16, 2015 comments to the THP 1-15-081, the planting of native conifers and hardwoods in Napa County is the **only** proportional wildlife-GHG A7-02

mitigation measure. Also, the area of land to be used for mitigation of the cut conifers and oaks, is very poor soil, and effectively the Davis Project team can plant in their remeadiation area, but they will not grow. This is very basic to this issue. When direct or indirect biogenic GHG emissions effects occur when native forest resources are harvested. This immediate loss of biomass carbon sequestration occurs and cannot be mitigated with a "toy forest" planting. A7-02 (Cont.)

I reference the Quercus Group's submission below:

Quercus Group

Forest & Greenhouse Gas Consultants
a division of Horizon Forest Products
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510/236-0924 / QuercusGrp@sbcglobal.net

September 16, 2015

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SantaRosaPublicComment@fire.ca.gov

Re: THP 1-15-081 NAP

CAL FIRE:

The Quercus Group appreciates the opportunity to submit THP 1-15-081 NAP comments. Review of the THP finds that it fails to fully account for greenhouse gas (GHG) emissions pursuant to California Environmental Quality Act (CEQA) project requirements. Specifically, the THP provides no analysis regarding potential indirect biogenic carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) emission effects or proportional mitigation measures. This THP omission represents a failure to proceed in the manner prescribed by CEQA. A7-03

Comment #1

Both direct and indirect biogenic GHG emissions effects occur when native forest resources are harvested. When a native tree species is felled biomass carbon sequestration ceases. This immediate loss of biomass carbon sequestration capacity represents the direct forest biogenic GHG emission effect. Upon disposal or utilization of the biomass carbon not stored in solid lumber products, the decomposition of biomass does in all cases result in indirect CO_2 and CH_4 emissions[1] and the combustion of biomass does in all cases result in indirect CO_2, CH_4 and , N_2O emissions.[2] Thus, a THP GHG emission effects analysis requires carbon dioxide equivalent (CO_2e)[3] estimations for both the direct effect from loss of carbon sequestration and the indirect effect due to biogenic emissions associated with residual biomass disposal or utilization. See Exhibit A and B citations regarding biomass decomposition and combustion indirect biogenic GHG emissions.

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[1] "Anaerobic digestion, chemical process in which organic matter is broken down by microorganisms in the absence of oxygen, which results in the generation of carbon dioxide (CO_2) and methane (CH_4) .... Sugars, starches, and cellulose produce approximately equal amounts of methane and carbon dioxide." Encyclopædia Britannica (2013). http://www.britannica.com/EBchecked/topic/22310/anaerobic-digestion

[2] "... the combustion of biomass does in all cases result in net additions of CH_4 and N_2O to the atmosphere, and therefore emissions of these two greenhouse gases as a result of biomass combustion should be accounted for in emission inventories under Scope 1" (at p. 11). World Resources Institute/World Business Council for Sustainable Development (2005).
http://www.ghgprotocol.org/files/ghgp/tools/Stationary_Combustion_Guidance_final.pdf

[3] AB32 defines carbon dioxide equivalent to mean ..."the amount of carbon dioxide by weight that would produce the same global warming impact as a given weight of another greenhouse gas, based on the best available science, including from the Intergovernmental Panel on Climate Change." CARB lists methane as having 25 times more climate impact than CO_2 and nitrous oxide as having 298 times more climate impact than CO_2 over a 100-year time horizon.

The following 2009 Natural Resources Agency CEQA GHG Amendments response to comments quotation supports the contention that direct and indirect biogenic GHG emissions effects occur when native forest resources are converted. The response use of the word "and" clearly indicates that there are two potentially significant GHG emission effects to be analyzed regarding forest conversion to another land use. CEQA recognizes the secondary biogenic GHG emissions in the indirect effects language of Guidelines § 15358(2), *"... are later in time or farther removed in distance, but are still reasonably foreseeable."*

Natural Resources Agency Response 66-7
"As explained in the Initial Statement of Reasons, conversion of forest lands to non-forest uses may result in greenhouse gas emissions and reduce sequestration potential. (Initial Statement of Reasons, at pp. 63-64.)"

Comment #2
Please supply substantial evidence supporting the methodology used in calculating the following THP indirect biogenic CO_2e emissions:

How many metric tonnes of biomass will be burned on-site? What are the estimated combustion CO_2, CH_4 and N_2O emissions over a 100-year planning horizon?

How many metric tonnes of chipped biomass and non-merchantable timber will be delivered to wood-fired energy plants, sold to other users or utilized on-site? What are the estimated CO_2, CH_4 and N_2O emissions over a 100-year planning horizon?

Explain how the THP GHG mitigation measures will provide consistency with the Executive Order S-3-05 2050 emissions reduction target. See *Cleveland National Forest Foundation, et al. v. San Diego Association of Governments, et al.* (2014) ___ Cal.App.4th ___, 2014 WL 6614394.

A7-03
(Cont.)

Comment #3
The DEIR assertions regarding compliance with CEQA Guidelines § 15064.4 via tiering to the unsuitable Bay Area Air Quality Management District project thresholds of significance or a nonexistent local Climate Action Plan emissions limit are unsupported by science, fact and law. See Exhibit C for additional BAAQMD project threshold comments.

Comment #4
The proposed non-local GHG emissions carbon credits mitigation does nothing to mitigate the impacts to local wildlife species due to the removal of native conifer/hardwood habitat or Napa County's rapid conversion of forest resources. Further, the purchased credit trees aren't suddenly going to begin growing faster and sequester more carbon to make up for the lost sequestration capacity of the removed trees. Pursuant to the state's 2050 GHG reduction target, a project must mitigate 80 percent of forest land conversion direct and indirect biogenic GHG emissions. The only way to proportionally mitigate both the forest conversion biogenic emissions and wildlife impacts is by planting/maintaining the requisite number of replacement native trees in Napa County.

Summary
This THP has lost sight of the fact that CEQA's GHG focus is *"the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions,"* not carbon sequestration per se. Substantial evidence has been presented that project biogenic GHG emissions due to forest land conversion will result in potentially significant environmental effects that have not been sufficiently analyzed or feasibly mitigated. The project has not made *"a good-faith effort, based to the extent possible on scientific and factual data, to describe,*

calculate or estimate the amount of greenhouse gas emissions resulting from a project" (CEQA Guidelines § 15064.4(a). Therefore THP 1-15-081 NAP is deficient as an informational document, in that it fails to apprise decision-makers/public of the full range and intensity of the adverse GHG emission effects on the environment that may reasonably be expected if the project is approved.

A7-03
(Cont.)

Sincerely,

Ron Cowan

Ron Cowan, Principal

cc: Napa Vision 2050

Exhibits (3)

Exhibit A

Biomass Combustion and Decomposition GHG Emissions

Governor Brown

"We must also reduce the relentless release of methane, black carbon and other potent pollutants across industries. And we must manage farm and rangelands, forests and wetlands so they can store carbon." – January 2015 inaugural address regarding the state's greenhouse gas reduction goals for the next 15 years.

California Air Resources Board

"California is committed to reducing emissions of CO_2, which is the most abundant greenhouse gas and drives long-term climate change. However, short-lived climate pollutants [methane, etc.] have been shown to account for 30-40 percent of global warming experienced to date. Immediate and significant reduction of both CO_2 and short-lived climate pollutants is needed to stabilize global warming and avoid catastrophic climate change." *Reducing Short-Lived Climate Pollutants in California, 2014.*

UC Irvine Engineering

"Generation of electricity from biomass is unique among the potential technologies for meeting RPS [renewable portfolio standards] goals in that it is associated with the generation of substantial amounts of GHGs and pollutants at generation sites during operation. This feature elucidates the importance in assessing GHG and air quality impacts from biopower." Sospedra, M. and Dabdub, D. (2015). *Assessment of the Emissions and Energy Impacts of Biomass and Biogas Use in California.*

A7-03
(Cont.)

Stanford University Engineering

Biomass burning also includes the combustion of agricultural and lumber waste for energy production. Such power generation often is promoted as a "sustainable" alternative to burning fossil fuels. And that's partly true as far as it goes. It is sustainable, in the sense that the fuel can be grown, processed and converted to energy on a cyclic basis. But the thermal and pollution effects of its combustion - in any form - can't be discounted, [Mark] Jacobson said.

"The bottom line is that biomass burning is neither clean nor climate-neutral," he said. "If you're serious about addressing global warming, you have to deal with biomass burning as well."
engineering.stanford.edu/news/stanford-engineers-study-shows-effects-biomass-burning-climate-health (2014).

Phoenix Energy

"As wood starts to decompose it releases roughly equal amounts of methane (CH_4) and carbon dioxide (CO_2)." 2014. http://www.phoenixenergy.net/powerplan/environment

Macpherson Energy Corporation

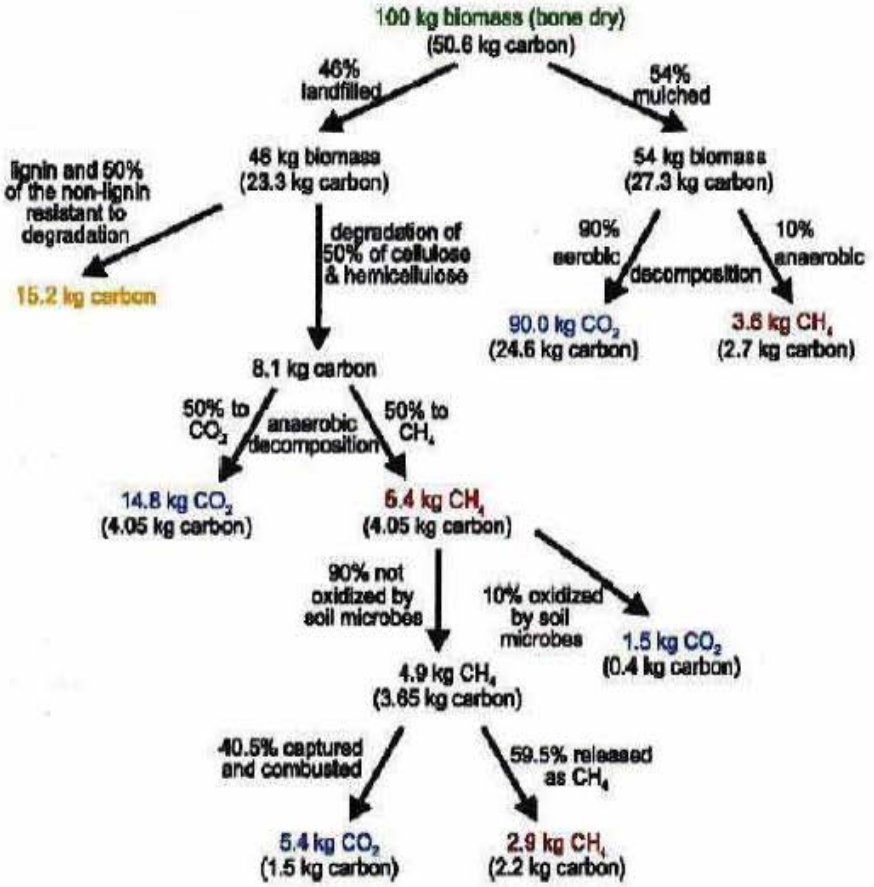
"Rotting produces a mixture of up to 50 percent CH_4, while open burning produces 5 to 10 percent CH_4." 2014. http://macphersonenergy.com/mt-poso-conversion.html

Exhibit B

Biomass Decomposition Greenhouse Gas Emissions

Biomass presentation by Alex Hobbs, PhD, PE to the Sierra Club Forum at North Carolina State University (November 24, 2009).

- If 100 kilograms of bone dry biomass were dispersed to a controlled landfill (46%) and mulched (54%) greenhouse gas emissions would be: 111.7 kilograms of CO_2 emissions + 6.5 kilograms of CH_4 emissions = 274.2 kilograms CO_2-equivalent emissions.



Landfill: 46 kg biomass/23.3 kg CO = 21.7 kg CO_2 + 2.9 kg CH_4 = 94.2 kg CO_2-equivalent.
Mulch: 54 kg biomass/27.3 kg CO = 90 kg CO_2 + 3.6 kg CH_4 = 180 kg CO_2-equivalent.
Total: 100 kg biomass/50.6 kg CO = 111.7 kg CO_2 + 6.5 kg CH_4 = 274.2 kg CO_2-equivalent

A7-03
(Cont.)

Exhibit C

Application of the Bay Area Air Quality Management District Threshold of Significance Does Not Reduce Project Forest Land Conversion Biogenic Greenhouse Gas Emissions to Less Than Significant

The project THP-DEIR GHG emissions evaluation concluded:

- *"... the Proposed Project's design reduces greenhouse gas (GHG) emissions from construction by 39 percent from "business as usual" practices, which results in a less than significant impact to climate change. Since the County's draft Climate Action Plan (CAP) provides for a reduction in GHG emissions by 38 percent, the Proposed Project meets the draft CAP"* (THP at 138).

- *"As shown in Table 4.7-2, operational GHG emissions would be less than the BAAQMD CEQA threshold of 1,100 MT of CO_2e for project-level operation; therefore, operation of the Proposed Project would result in a less-than-significant impact to climate change"* (DEIR at 4.7-10).

Citing an unapproved threshold of significance derived from a nonexistent CAP does not constitute substantial evidence. Additionally, Napa County acknowledged in 2010 that the BAAQMD project threshold of significance was not designed to address direct and indirect forest land conversion biogenic GHG emissions.[4] In fact the BAAQMD project threshold specifically excludes biogenic GHG emissions analysis, including forest land conversion, which is inconsistent with CEQA requirements. The California Natural Resources Agency addressed this issue during the CEQA GHG rulemaking process regarding forest land conversion:

> *"[T]he Natural Resources Agency notes that SB97 did not distinguish between the sources of greenhouse gas emissions. Thus, it would not be appropriate for the Natural Resources Agency to treat the different categories of emissions differently absent a legislative intent that the Guidelines do so. Neither AB32 nor the Air Resources Board's Scoping Plan distinguishes between biogenic and anthropogenic sources of greenhouse gas emissions. On the contrary, the Scoping Plan identifies methane from, among other sources, organic wastes decomposing in landfills as a source of emissions that should be controlled."* (2009 Final Statement of Reasons, Response to Comment 95-1)

A7-03 (Cont.)

In a 2010 article BAAQMD Assistant Counsel Alexander Crockett recognized the limitations of his agency's project GHG thresholds of significance by stating that, *"... it is no longer appropriate to simply apply the local air district's thresholds as stated without further analysis."*[5] Since the BAAQMD project threshold fails to account for forest land conversion biogenic emissions, these GHG emissions must be analyzed and mitigated independent of the BAAQMD project threshold of significance standard.

Summary

A greenhouse gas project threshold of significance that excludes an entire category of GHG emissions cannot be claimed to unequivocally reduce all impacts to less than significant. Moreover, forest land oversight is the purview of the state not the BAAQMD and California hasn't established a forest land conversion threshold of significance.

---

[4] Conservation, Development and Planning. *Greenhouse Gas Emissions Associated with Vineyard Development and Operations*, July 20, 2010 at p. 4.

[5] Environmental Law News. *Another Hot Year: Analyzing Greenhouse Gas Impacts under CEQA*, Spring 2010 at pp. 12-14.

The DEIR states that the project would cut down the majority of oak woodlands existing on the property, it proposes measures that are insufficient to mitigate the impact and would actually cause habitat breakdown and harm the ecological activity on the site. Without remedying these and other problems in the Draft, CAL FIRE should not legally approve the proposal. A7-04

The DEIR lacks support from the ECP's language in that it does not address the phased-in approach and the assurances necessary to understand the immediate and long range impact on the St. Helena water supply. In St. Helena's response, the City water department is very concerned about the herbicides, fertilizers, run-off and invasive species that will be introduced immediately, and for years to come. A7-05

As mentioned in my introduction, the DEIR does little to consider the impact to the surrounding area; most specifically the Dunn-Wildlake Preserve. This project obviously will affect the natural beauty, water resources, wildlife, and overall biologic resources. The Preserve surrounds the Davis Project on two sides (Davis' property is an inclusion) and the harvesting of timber will aesthetically do immediate and non-remedial harm to the Preserve. There hasn't been a hunting lodge on the Wildlake Preserve since the Land Trust established the Preserve. Therefore that description in the DEIR is false, and we must all keep in mind that acquisition and protection of the Preserve, which was funded by private foundations, public entities and Napa County residents, including the Dunn family, the California Conservation Board, Dept. of Fish and Wildlife, and the David Packard Foundation. The DEIR must acknowledge that the property if located directly within this very large wildlife complex of lands. A7-06

I site the Land Trust sponsored correspondence from Shute, Mihaly and Weinberger of October2, 2015 addressed to CAL FIRE, in which their biologist countered the DEIR assertions with their scientific observations that many species like the nodding harmonia, tall snapdragon and others are on the property. Additionally migratory bird populations would be affected and because the DEIR does not recognize their presence, it fails to consider this impact. This lack of proper analysis continues in regard to native habitat and special status species. Observationally, and within the DEIR, it is stated that the Western Pond Turtle inhabits the lake (No Name Lake) within the Davis Property. As Mr. Graves indicated in his response to the DEIR, this species is on the process, right now, to be listed on the endangered species list. Therefore the time to protect them is now. The DEIR asserts that the Western Pond Turtles would not use any portion of the clear cut area. How can this possibly be accurate? When the trees come down, there will be rock blasting and milling of trees onsite. Several species that are near the site, but not identified within, do travel, they do move, and will be affected during and after the timber harvest. There will be increased human activity and soil character disturbance. Increased equipment usage over the only route in and out, on Friesen Drive, will impact the noise and A7-07

environmental peace that presently exits. The input of non-native species is yet another threat to the general area; both in Bell Canyon drainage and in the next-door's Wildlake Preserve. Without an analysis of these problems, the DEIR cannot conclude that impacts to these resources will be less than-significant. While no Northern Spotted Owls were identified within the property, reality shows they are very near (spotted within 1 miles). The DEIR must consider how clear cutting, blasting, ripping and vineyard activity situated on the edge of this property, will be affected. A7-07 (Cont.)

As mentioned in my opening, the DEIR's mitigation measures in regard to the Oak Woodlands is inadequate. The idea of Mitigation Measure 4.4-1 states that other trees will be planted on another site within the property. The site identified has "tuffa-like" soil and will not sustain a new planting of Oaks. The GHG sequestration losses cannot be mitigated from such a folly and we must have absolute assurances that the oak woodlands can be permanently protected. Without permanent protection of the oaks in the retention areas, the applicant or a future owner could undermine this mitigation measure by developing a new project on those areas. Evidence has been provided that the retention area is already encumbered by an easement that would preclude it from being used as claimed in the DEIR. In order to provide mitigation, the DEIR must preserve or restore land that is not already protected from development. A7-08

The DEIR fails to adequately analyze the fire hazard potential. The entire property is located on land that CAL FIRE as designated as a "very high fire hazard severity zone." We've had huge wildfires this summer. We've experienced mandatory evacuations in Angwin and the Valley fire burned within 4 miles of the property and burned more than 76,000 acres. Before approving a project like this, numerous assessments must be taken into account. We could have sparks from equipment, burning will take place during tree harvest, blasting to prepare the site for vines, and most notably the DEIR mentions nothing about the project requiring vineyard workers to the site regularly to a Very High Fire Hazard Severity Zone. A7-09

The DEIR's analysis of the impact to water quality and quantity is inadequate. Pesticides, herbicides, and fertilizer applications will ultimately reach the Bell Canyon Reservoir and the Napa River. The Napa River is already identified as "impaired by nutrient loading." The DEIR does not address this potential of water quality impairment downstream of the project. The Integrated Pest Management Plan calls for use of these chemicals but does not provide any protection of these chemicals from getting into the water supply downstream. Also, the project A7-10

does not meet Regional Water Quality Control Board requirements for reducing sediment into the Napa River watershed. A7-10 (Cont.)

Another troubling area concerns the projects consistency with the Napa County General Plan. We find that Con-2: Maintain and enhance the existing level of biodiversity, Con-3: potect the continued presence of special status species, etc, Con-4: Conserve, protect and improve plant, wildlife and fishery habitats for all native species in Napa County, and Con-5: Protect connectivity and continuous habitat areas for wildlife movement. The Friesen Lakes, Wildlake Preserve and this Davis project are highly acclaimed for the wildlife within this corridor. A7-11

The DEIR's assumption concerning Project Alternatives is inadequate. The Forest Practice Act requires THP's to evaluate feasible alternatives. However this THP's alternative analysis considers a separate list of alternatives from the DEIR and ignores the NO TIMBER CONVERSION ALTERNATIVE. The DEIR does not offer any alternative ideas other than the NTCA. There are assumptions made that leads CAL FIRE to presume this is the most environmentally safe way to do this project. How can that claim be made when no real alternative is suggested? A7-12

The DEIR presents the assumption that individual project would have less than-significant impacts is flawed because CEQA mandates that the individual project be assessed in a full view of what several of these type projects would result. Even if this individual project is considered minor, it should be viewed in conjunction with impacts from other projects. The DEIR violates this requirement because it concludes that no cumulative impacts would occur.

We at Save Rural Angwin feels the DEIR is flawed, both legally and has numerous inconsistencies, not the least of which are its lack of focus on the Napa County General Plan. The DEIR and the THP show numerous CEQA violations that certainly require further analysis. A7-13

Yours truly,

Mike Hackett, Chairman Save Rural Angwin

Comment Letter A8

From: Zador, Daniel [mailto:Daniel.Zador@countyofnapa.org]
Sent: Monday, October 05, 2015 5:53 PM
To: 'Hall, Dennis@CALFIRE' <Dennis.Hall@fire.ca.gov>
Cc: Solinsky, Bill@CALFIRE <Bill.Solinsky@fire.ca.gov>; Annalee Sanborn <asanborn@analyticalcorp.com>; Bordona, Brian <Brian.Bordona@countyofnapa.org>
Subject: SCH#2014062076, 1-15-081NAP: Napa County PBES Comment Letter re Friesen Vineyard THP/TCP and DEIR: 1-15-081 - NAP

Dennis,

We have reviewed the Draft EIR for the subject project and our office does have comments to make on the Draft EIR; however, we haven't finished finalizing our comment letter to make it the most productive for your use. There currently appear to be multiple Napa County General Plan Policies with which the project may be inconsistent, and we will need such items addressed before we would be in a position to move forward with the Napa County Erosion Control Plan permit component of the project.

A8-01

Would you please extend our deadline for comments to you on the Draft EIR until this Thursday, October 8, 2015? Our office should have comments wrapped up in the next day or so. You are welcome to call me or my supervisor Brian Bordona (707-259-5935) with any questions you may have.

Thank you,
Dan

Daniel Zador
Planner II
Napa County Planning, Building, and Environmental Services Department
1195 Third Street, Suite 210 Napa, CA 94559
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October 5, 2015

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Re: Comments on Davis Friesen Vineyard Draft EIR ("DEIR")

Dear Mr. Solinsky,

We request an extension of the public comment period on the above referenced draft EIR until Nov. 30, 2015. This project includes a Timber Harvest Plan, a Timber Conversion Permit and an Erosion Control Plan. Any one of these plans or permit activities effectively constitutes a separate project that merits thorough review, analysis, consultation with relevant experts in various fields, assessment of impacts, the drawing of conclusions, and preparation of written comments. Carrying out these steps on all three plans/permits involved here, including a DEIR of 281 pages, with an additional 625 pages of attachments including the aforesaid THP, TCP and ECP, has not been possible for our organization within the time frame allowed. We are asking that the public comment period be extended until November 30, 2015. A9-01

As a result of the inadequate time, our comments below represent only a partial, scattershot review of selected issues.

Napa County's Biological Issues for this Area

As stated in the *Napa County Baseline Data Report ("BDR")*, the Management Considerations for the Eastern Mountains area of Napa, which includes the project at issue, states that:

> [t]he primary concern to the area's biological resources is from rural residential development and vineyard conversion, which alters and fragments habitat for many species, and which influences stream hydrology through increased erosion. . . . . Maintaining wildlife movement corridors between the Atlas Peak-Mount George region and the Mount Saint Helena Conservation Area . . . is critical to ensure that sensitive populations do not become isolated. Unless development in this area is clustered, it could impact the movement of coniferous forest species found in the northern portion of the area . . . . (BDR p. 4-57, emphasis added)

A9-02

This project is a textbook case of failing to cluster development. The land use designation for the project property is Agriculture, Watershed, and Open Space. In fact, the property in the area is used primarily as watershed and open space land, without vineyards in the immediate or nearby vicinity. The applicant will therefore be newly introducing vineyards to the area.

Risk to the local bear population

Napa County is known to have black bears, a species whose habitat is being reduced by development. The DEIR correctly identifies black bear (*Ursus americanus*) as a species present in the area. However, there is no mention of the fact that young bear cubs are known to be frequently present in the area or any acknowledgement of the bear cub "nursery" role that this region plays in maintaining the current local population of bears. Nor is there discussion that grapes will attract bears to the property in question.

The DEIR notes that the "installation of the deer proof fence will eliminate the need for depredation of the deer within the vineyard blocks" but fails to mention how they will avoid depredation permits for bears.

A9-03

Napa has previously seen controversial depredation permits for bears issued to protect vineyards in remote areas of the county (*Bear controversy prowls vineyards of Pope Valley*, Napa Valley Register, Feb. 9, 2006). The applicant is well aware that land adjacent to the parcels at issue here includes the Dunn-Wildlake Preserve, acquired by the Land Trust of Napa County with public funding from a number of agencies (including the California Dept. of Fish and Wildlife) as well as foundation and private charitable contributions, because of its high levels of biodiversity.

In addition to the Preserve, other public and protected lands blanket this area. The introduction of grapes to an area of extensive natural lands and uninterrupted wildlife habitat will effectively create an attractive nuisance, causing bears to leave protected lands to consume the new source of food the applicant intends to grow. The increase risk to the bears needs to be discussed and mitigated, and a commitment made not to seek depredation permits.

Oak Trees

A9-04

Two issues are presented - the impact of this project, including the cutting of oak trees, on

greenhouse emissions, and the absurdity of mitigating the removal of those trees by removing other trees (coniferous) and hoping that oaks can successfully be grown instead, without any type of permanent commitment to preservation.

The inadequacy of the greenhouse gas analysis has been ably discussed by the *Quercus Group* with respect to THP 1-15-081 NAP. We send a copy of their letter to Cal Fire of September 16, 2015 along with this letter, and we concur with their comments. A9-04 (Cont.)

The removal of foothill pine trees as well as chaparral (chamise and manzanita), will itself have impacts that must be mitigated. In addition, whether or not this activity would be successful seems to be entirely speculative. This proposal does not rise to the level of certainty and permanency needed for oak tree mitigation.

Inadequate Surveys

We are aware that there have been sightings of rare and endangered plant species on the property at issue, viewed from Friesen Drive that runs through this land, that have not been found by the surveys conducted in connection with this project. That the sightings are along the road and therefore easily accessible, suggests that the surveys conducted are inadequate. A further more comprehensive survey should be conducted with a view to encompassing the seasons which present the best opportunity to view blooming species. A9-05

Western Pond Turtle

Just this year the U.S. Fish and Wildlife Service concluded that protection under the Endangered Species Act may be warranted for the Western Pond Turtle, already a Species of Special Concern in California, and began a one-year study period to make a final determination.

The DEIR acknowledges that there are Western pond turtles in the small lake/reservoir on the east side of the property, but erroneously assumes that these turtles do not stray beyond an aquatic environment (DEIR p. 4.4-40) and on that assumption, concludes that activities on land will not result in any impacts and thus no mitigation is needed (DEIR p. 4.4-52).

Pond turtles make extensive use of terrestrial upland regions, both for overwintering (*average* distance of over-wintering sites from the water found be to 167 meters (547 feet) and nesting (nesting sites found as far as 400 meters (1,312 ft) from water, Western Pond Turtle, Natural History, USDA Forest Service, A9-06
http://www.krisweb.com/biblio/gen_usfs_ashtonetal_1997_turtle.pdf

Other studies and reports confirm that pond turtles spend a substantial part of the year in terrestrial habitat hundreds of feet from the water. Consequently, each of the planned vineyard blocks may constitute Western pond turtle habitat. At a minimum the impact must be assessed, and possible mitigation devised. Given the range of this species, it may be that the impact cannot be mitigated.

The extent to which this statement is inaccurate casts doubt on much of their biological analysis.

Impact of Blasting

The DEIR states that blasting to remove rocks in order to develop the vineyard blocks will be A9-07

occurring. We are unable to assess the impact of this activity, without a clearer idea of the magnitude of this removal or to determine if the activity is sufficiently extensive to trigger issues and concerns relating to mining.

A9-07 (Cont.)

In addition, there is no indication of whether any rocky outcrops, a unique and important habitat in Napa which is present on this site, are intended to be removed. If so, analysis of the environmental impact is critical. "Rock outcrops provide a key habitat for special status plants, raptors, and bats" in Napa County. BDR, p. 4-57.

Alternatives

The DEIR fails to analyze a range of alternatives, but merely considers one, which encompasses a substantial decrease in the acres of vineyard developed, in addition to the *No Project Alternative*. According to the DEIR neither case would achieve the level of economic success the applicant seeks.

Failure to achieve the *maximum* financial return possible from a parcel of property is not a bar to analysis of other alternatives under CEQA. Alternatives which provide a lesser financial return can still be reasonable and merit discussion.

In this context the *No Timber Conversion Alternative* is declared to be "not economically viable" because of the reduced vineyard acreage. However, no financial data, or any other data, is cited in support of this statement. Consequently, the declaration is unsupported and should be rejected.

The DEIR does not examine the most viable alternative which would allow the objectives to be met with lesser environmental impact - an alternative offsite location. We understand that other sites, even in the Howell Mountain area if that is an issue, are available and suitable for vineyards and may present substantially lesser environmental impacts. A9-08

CEQA Guidelines emphasize that the selection of project alternatives be based primarily on the ability to reduce impacts relative to the proposed project, "even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly." Guidelines Sec. 15126.6(b). Of course, in selecting project alternatives for analysis, potential alternatives must pass a test of feasibility. It is clear, however, that feasable sites can include those that would need to be acquired:

> Among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability) economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries, and whether the proponent can reasonably acquire, control or otherwise have access to the alternative site. . ." Guidelines Section 15126.6(f)(1)

Based upon the above discussion, the alternatives analysis is inadequate.

Cumulative impacts

Given the inadequate, and in some cases clearly erroneous analysis and conclusions regarding biological resources, the cumulative impacts analysis is inherently flawed. In addition, although claiming otherwise the DEIR analysis appears to adopt the clearly incorrect position A9-09

that without significant impacts there can be no cumulative impacts. This misunderstanding clearly signals that a proper cumulative analysis has not been conducted because of the failure to comprehend the meaning of the concept.

An issue that needs to be included in the cumulative analysis is whether this project would lead to similar vineyard development in the immediate or near vicinity, either by the applicant or other developers. As with residential and commercial development, one such project can attract others to the area. Would the presence of this project increase the vulnerability of other hitherto undisturbed natural lands and wildlife habitat, compounding the impacts on biological resources currently benefiting from the extensive undeveloped lands in the area? This is a reasonable assumption the cumulative impact of which should be analyzed. A9-09 (Cont.)

Of equal concern is the potential for the applicant or another developer to add a winery, as well as a tasting room to attract visitors, food service, and events. All of these activities are common in Napa, and would compound the effect of the negative environmental impacts. The potential for this type of development should be added to the cumulative impact analysis.

A Revised DEIR is Required.

Even at the cursory level of review the limited time allowed us, it is clear that there are sufficient inadequacies and flaws in this DEIR to mandate that a revised DEIR be prepared and circulated. The failure to identify and acknowledge the presence of sensitive pant species which others have found alongside Friesen Drive indicates the inadequacy of the biological resources surveys. The lack of knowledge of Western pond turtle use of terrestrial upland habitat areas, and the inaccurate conclusions that led to, calls into question the merits of other resource analysis there is not time to review. In short, the issues discussed above are of sufficient magnitude to call into question the adequacy of the DEIR. The standard for revising and recirculating a DEIR, that the document is so inadequate and conclusory that meaningful public review and comment are precluded (Guidelines, Sec. 15088.5(a)(4)), is met in this case. A9-10

Sincerely,

Nancy Tamarisk
Chair, Napa Sierra Club Executive Committee

Att. Quercus Group, letter of Sept. 16, 2015, Re: THP 1-15-081 NAP

Comment Letter A10

-----Original Message-----
From: Carol Kunze [mailto:carol@tuleyome.org]
Sent: Monday, October 05, 2015 2:15 PM
To: Sacramento Public Comment@CALFIRE <SacramentoPublicComment@fire.ca.gov>; Santa Rosa Public Comment@CALFIRE <SantaRosaPublicComment@fire.ca.gov>; daniel.zador@countyofnapa.org
Subject: Davis Friesen Vineyard - Napa Sierra Club Comments, THP 1-15-081 NAP

Nancy Tamarisk asked me to forward these comments on behalf of the Napa Sierra Club

Carol Kunze

A10-01

Quercus Group

Forest & Greenhouse Gas Consultants
a division of Horizon Forest Products
P.O. Box 5325 / Richmond, CA 94805
510/236-0924 / QuercusGrp@sbcglobal.net

September 16, 2015

CAL FIRE
Sonoma-Lake-Napa Unit
2210 West College Ave
Santa Rosa, CA 95403
SantaRosaPublicComment@fire.ca.gov

Re: THP 1-15-081 NAP

CAL FIRE:

The Quercus Group appreciates the opportunity to submit THP 1-15-081 NAP comments. Review of the THP finds that it fails to fully account for greenhouse gas (GHG) emissions pursuant to California Environmental Quality Act (CEQA) project requirements. Specifically, the THP provides no analysis regarding potential indirect biogenic carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) emission effects or proportional mitigation measures. This THP omission represents a failure to proceed in the manner prescribed by CEQA. A10-01 (Cont.)

Comment #1

Both direct and indirect biogenic GHG emissions effects occur when native forest resources are harvested. When a native tree species is felled biomass carbon sequestration ceases. This immediate loss of biomass carbon sequestration capacity represents the direct forest biogenic GHG emission effect. Upon disposal or utilization of the biomass carbon not stored in solid lumber products, the decomposition of biomass does in all cases result in indirect CO_2 and CH_4 emissions[1] and the combustion of biomass does in all cases result in indirect CO_2, CH_4 and , N_2O emissions.[2] Thus, a THP GHG emission effects analysis requires carbon dioxide equivalent (CO_2e)[3] estimations for both the direct effect from loss of carbon sequestration and the indirect effect due to biogenic emissions associated with residual biomass disposal or utilization. See Exhibit A and B citations regarding biomass decomposition and combustion indirect biogenic GHG emissions.

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[1] "Anaerobic digestion, chemical process in which organic matter is broken down by microorganisms in the absence of oxygen, which results in the generation of carbon dioxide (CO_2) and methane (CH_4) .... Sugars, starches, and cellulose produce approximately equal amounts of methane and carbon dioxide." Encyclopædia Britannica (2013). http://www.britannica.com/EBchecked/topic/22310/anaerobic-digestion A10-02

[2] "... the combustion of biomass does in all cases result in net additions of CH_4 and N_2O to the atmosphere, and therefore emissions of these two greenhouse gases as a result of biomass combustion should be accounted for in emission inventories under Scope 1" (at p. 11). World Resources Institute/World Business Council for Sustainable Development (2005).
http://www.ghgprotocol.org/files/ghgp/tools/Stationary_Combustion_Guidance_final.pdf

[3] AB32 defines carbon dioxide equivalent to mean ..."the amount of carbon dioxide by weight that would produce the same global warming impact as a given weight of another greenhouse gas, based on the best available science, including from the Intergovernmental Panel on Climate Change." CARB lists methane as having 25 times more climate impact than CO_2 and nitrous oxide as having 298 times more climate impact than CO_2 over a 100-year time horizon.

The following 2009 Natural Resources Agency CEQA GHG Amendments response to comments quotation supports the contention that direct and indirect biogenic GHG emissions effects occur when native forest resources are converted. The response use of the word "and" clearly indicates that there are two potentially significant GHG emission effects to be analyzed regarding forest conversion to another land use. CEQA recognizes the secondary biogenic GHG emissions in the indirect effects language of Guidelines § 15358(2), *"... are later in time or farther removed in distance, but are still reasonably foreseeable."* A10-02 (Cont.)

Natural Resources Agency Response 66-7

"*As explained in the Initial Statement of Reasons, conversion of forest lands to non-forest uses may result in greenhouse gas emissions and reduce sequestration potential.* (Initial Statement of Reasons, at pp. 63-64.)"

Comment #2

Please supply substantial evidence supporting the methodology used in calculating the following THP indirect biogenic CO_2e emissions:

How many metric tonnes of biomass will be burned on-site? What are the estimated combustion CO_2, CH_4 and N_2O emissions over a 100-year planning horizon?

How many metric tonnes of chipped biomass and non-merchantable timber will be delivered to wood-fired energy plants, sold to other users or utilized on-site? What are the estimated CO_2, CH_4 and N_2O emissions over a 100-year planning horizon? A10-03

Explain how the THP GHG mitigation measures will provide consistency with the Executive Order S-3-05 2050 emissions reduction target. See *Cleveland National Forest Foundation, et al. v. San Diego Association of Governments, et al.* (2014) ___ Cal.App.4th ___, 2014 WL 6614394.

Comment #3

The DEIR assertions regarding compliance with CEQA Guidelines § 15064.4 via tiering to the unsuitable Bay Area Air Quality Management District project thresholds of significance or a nonexistent local Climate Action Plan emissions limit are unsupported by science, fact and law. See Exhibit C for additional BAAQMD project threshold comments. A10-04

Comment #4

The proposed non-local GHG emissions carbon credits mitigation does nothing to mitigate the impacts to local wildlife species due to the removal of native conifer/hardwood habitat or Napa County's rapid conversion of forest resources. Further, the purchased credit trees aren't suddenly going to begin growing faster and sequester more carbon to make up for the lost sequestration capacity of the removed trees. Pursuant to the state's 2050 GHG reduction target, a project must mitigate 80 percent of forest land conversion direct and indirect biogenic GHG emissions. The only way to proportionally mitigate both the forest conversion biogenic emissions and wildlife impacts is by planting/maintaining the requisite number of replacement native trees in Napa County. A10-05

Summary

This THP has lost sight of the fact that CEQA's GHG focus is *"the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions,"* not carbon sequestration per se. Substantial evidence has been presented that project biogenic GHG emissions due to forest land conversion will result in potentially significant environmental effects that have not been sufficiently analyzed or feasibly mitigated. The project has not made *"a good-faith effort, based to the extent possible on scientific and factual data, to describe,* A10-06

calculate or estimate the amount of greenhouse gas emissions resulting from a project" (CEQA Guidelines § 15064.4(a). Therefore THP 1-15-081 NAP is deficient as an informational document, in that it fails to apprise decision-makers/public of the full range and intensity of the adverse GHG emission effects on the environment that may reasonably be expected if the project is approved.

Sincerely,

Ron Cowan

Ron Cowan, Principal

cc: Napa Vision 2050

Exhibits (3)

A10-06
(Cont.)

Exhibit A

Biomass Combustion and Decomposition GHG Emissions

Governor Brown

"We must also reduce the relentless release of methane, black carbon and other potent pollutants across industries. And we must manage farm and rangelands, forests and wetlands so they can store carbon." – January 2015 inaugural address regarding the state's greenhouse gas reduction goals for the next 15 years.

California Air Resources Board

"California is committed to reducing emissions of CO_2, which is the most abundant greenhouse gas and drives long-term climate change. However, short-lived climate pollutants [methane, etc.] have been shown to account for 30-40 percent of global warming experienced to date. Immediate and significant reduction of both CO_2 and short-lived climate pollutants is needed to stabilize global warming and avoid catastrophic climate change." *Reducing Short-Lived Climate Pollutants in California, 2014.*

UC Irvine Engineering

"Generation of electricity from biomass is unique among the potential technologies for meeting RPS [renewable portfolio standards] goals in that it is associated with the generation of substantial amounts of GHGs and pollutants at generation sites during operation. This feature elucidates the importance in assessing GHG and air quality impacts from biopower." Sospedra, M. and Dabdub, D. (2015). *Assessment of the Emissions and Energy Impacts of Biomass and Biogas Use in California.*

Stanford University Engineering

Biomass burning also includes the combustion of agricultural and lumber waste for energy production. Such power generation often is promoted as a "sustainable" alternative to burning fossil fuels. And that's partly true as far as it goes. It is sustainable, in the sense that the fuel can be grown, processed and converted to energy on a cyclic basis. But the thermal and pollution effects of its combustion - in any form - can't be discounted, [Mark] Jacobson said.

"The bottom line is that biomass burning is neither clean nor climate-neutral," he said. "If you're serious about addressing global warming, you have to deal with biomass burning as well."
engineering.stanford.edu/news/stanford-engineers-study-shows-effects-biomass-burning-climate-health (2014).

Phoenix Energy

"As wood starts to decompose it releases roughly equal amounts of methane (CH_4) and carbon dioxide (CO_2)." 2014. http://www.phoenixenergy.net/powerplan/environment

Macpherson Energy Corporation

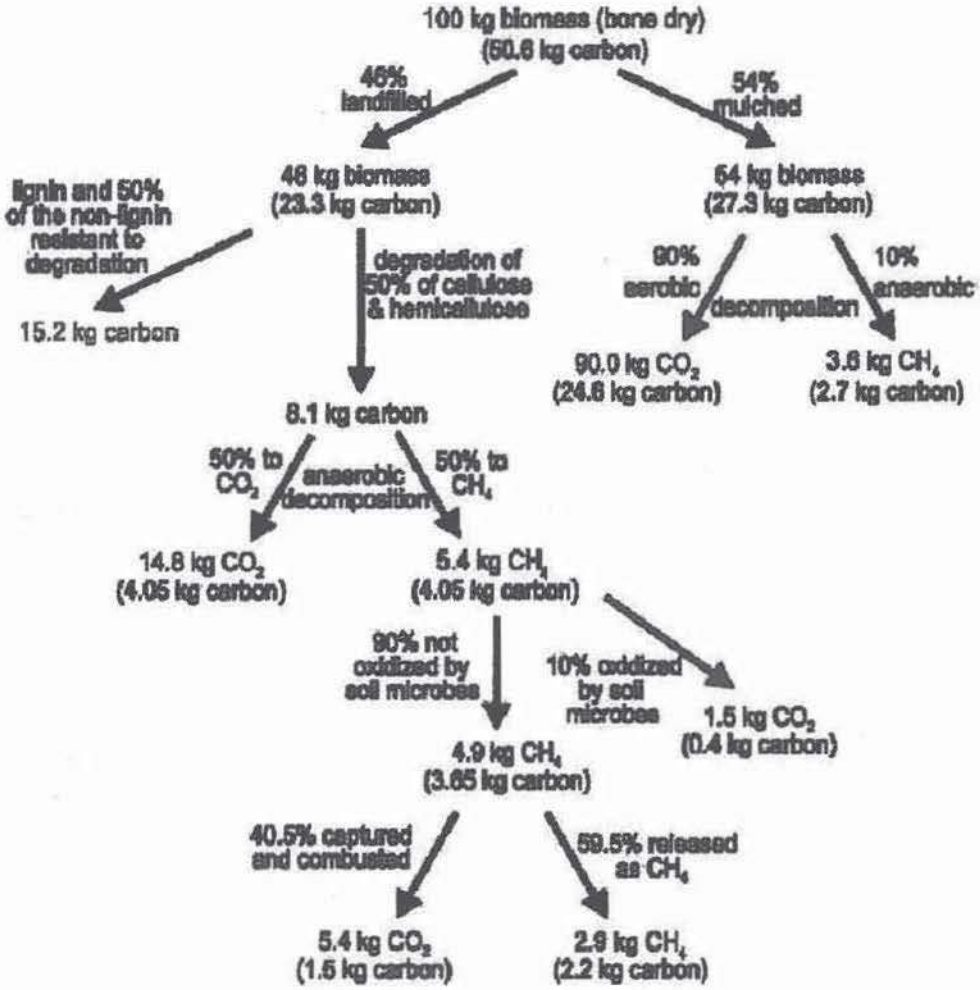
"Rotting produces a mixture of up to 50 percent CH_4, while open burning produces 5 to 10 percent CH_4." 2014. http://macphersonenergy.com/mt-poso-conversion.html

Exhibit B

Biomass Decomposition Greenhouse Gas Emissions

Biomass presentation by Alex Hobbs, PhD, PE to the Sierra Club Forum at North Carolina State University (November 24, 2009).

- If 100 kilograms of bone dry biomass were dispersed to a controlled landfill (46%) and mulched (54%) greenhouse gas emissions would be: 111.7 kilograms of CO_2 emissions + 6.5 kilograms of CH_4 emissions = 274.2 kilograms CO_2-equivalent emissions.



Landfill: 46 kg biomass/23.3 kg CO = 21.7 kg CO_2 + 2.9 kg CH_4 = 94.2 kg CO_2-equivalent.
Mulch: 54 kg biomass/27.3 kg CO = 90 kg CO_2 + 3.6 kg CH_4 = 180 kg CO_2-equivalent.
Total: 100 kg biomass/50.6 kg CO = 111.7 kg CO_2 + 6.5 kg CH_4 = 274.2 kg CO_2-equivalent

Exhibit C

Application of the Bay Area Air Quality Management District Threshold of Significance Does Not Reduce Project Forest Land Conversion Biogenic Greenhouse Gas Emissions to Less Than Significant

The project THP-DEIR GHG emissions evaluation concluded:

- *"... the Proposed Project's design reduces greenhouse gas (GHG) emissions from construction by 39 percent from "business as usual" practices, which results in a less than significant impact to climate change. Since the County's draft Climate Action Plan (CAP) provides for a reduction in GHG emissions by 38 percent, the Proposed Project meets the draft CAP"* (THP at 138).

- *"As shown in Table 4.7-2, operational GHG emissions would be less than the BAAQMD CEQA threshold of 1,100 MT of CO_2e for project-level operation; therefore, operation of the Proposed Project would result in a less-than-significant impact to climate change"* (DEIR at 4.7-10).

Citing an unapproved threshold of significance derived from a nonexistent CAP does not constitute substantial evidence. Additionally, Napa County acknowledged in 2010 that the BAAQMD project threshold of significance was not designed to address direct and indirect forest land conversion biogenic GHG emissions.[4] In fact the BAAQMD project threshold specifically excludes biogenic GHG emissions analysis, including forest land conversion, which is inconsistent with CEQA requirements. The California Natural Resources Agency addressed this issue during the CEQA GHG rulemaking process regarding forest land conversion:

> *"[T]he Natural Resources Agency notes that SB97 did not distinguish between the sources of greenhouse gas emissions. Thus, it would not be appropriate for the Natural Resources Agency to treat the different categories of emissions differently absent a legislative intent that the Guidelines do so. Neither AB32 nor the Air Resources Board's Scoping Plan distinguishes between biogenic and anthropogenic sources of greenhouse gas emissions. On the contrary, the Scoping Plan identifies methane from, among other sources, organic wastes decomposing in landfills as a source of emissions that should be controlled."* (2009 Final Statement of Reasons, Response to Comment 95-1)

In a 2010 article BAAQMD Assistant Counsel Alexander Crockett recognized the limitations of his agency's project GHG thresholds of significance by stating that, *"... it is no longer appropriate to simply apply the local air district's thresholds as stated without further analysis."*[5] Since the BAAQMD project threshold fails to account for forest land conversion biogenic emissions, these GHG emissions must be analyzed and mitigated independent of the BAAQMD project threshold of significance standard.

Summary

A greenhouse gas project threshold of significance that excludes an entire category of GHG emissions cannot be claimed to unequivocally reduce all impacts to less than significant. Moreover, forest land oversight is the purview of the state not the BAAQMD and California hasn't established a forest land conversion threshold of significance.

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[4] Conservation, Development and Planning. *Greenhouse Gas Emissions Associated with Vineyard Development and Operations*, July 20, 2010 at p. 4.

[5] Environmental Law News. *Another Hot Year: Analyzing Greenhouse Gas Impacts under CEQA*, Spring 2010 at pp. 12-14.

UNIT, ~~FG, WQ~~, ER, ~~UM~~, RPF

From: Tibby Elgato <chinacat1970@gmail.com>
Sent: Monday, October 05, 2015 11:45 AM
To: Santa Rosa Public Comment@CALFIRE
Cc: Madigan, John@Waterboards
Subject: Comments on 01-15-081-NAP
Attachments: Comments081NAP2.pdf

Attached find comments on this THP. I have also copied the state waterboards.
Please have them added to the public record.
Thanks,
Dr. John W. Cruz
Forest Unlimited Logging Review Program Manager

A11-01

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PO Box 506 • Forestville CA 95436 • 707.632.6070

September 29, 2015
Director
Cal Fire
135 Ridgeway Ave.
Santa Rosa, Ca 95402

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Dear Director,

The following comments pertain to THP 01-15-081 NAP. Please given them your attention and have them submitted into the public record.

A11-01 (Cont.)

General Comments

1. Are new wells a part of this development?

2. This vineyard is on a dead end road. How will it be accessed for fire suppression in this area that is well know to be very susceptible to fire?

A11-02

3. The THP considers only air quality impacts as detailed in the referenced DEIR and does not consider how it contributes to the statewide goals of reducing CO2 emissions statewide, as required.

California law requires specific quantifiable action on the part of the logging industry to address Global Warming through CO2 sequestration in all the plans it submits.

Our forests are acknowledged by the state of California to play a critical role in the state's carbon balance with the unique capacity to remove CO2 from the air and store it long-term to reduce the harmful effects of global warming. The forest sector is seen by the state to provide the only mechanism for a net removal of Greenhouse Gases (GHGs).

A11-03

According to the California Board of Forestry, link below,

[http://bofdata.fire.ca.gov/board_committees/interagency_forestry_working_group/current_projects/ifwg_task_2_final_3_20_12.pdf]

the forest sector is to have a net sequestration of 5 million metric tons of CO2 equivalents by 2020.

The Forest Practices Act was amended by the legislature in 2011 to recognize role of forest carbon sequestration in meeting CO2 sequestration goals. Changes included addition of PRC 4512.5 (a)-(e), PRC 4513 and PRC 4551. These additions to the Forest Practice Act require the adherence to rules and regulations that govern the harvesting of commercial forests meet AB 32 greenhouse gas reduction goals.

This plan does not show how the proposed logging activity and conversion will contribute to the goal of achieving a sector wide goal of 5 MMTCO2 by 2020, thus it is inconsistent with California law. No data is shown to justify the implied notion that removing these trees will contribute to the sector wide goal of CO2 sequestration by 2020. It is not established how the purchase of 1601 MT GHG emission credits described on Page 139 contributes to the statewide goal or offsets the removal of forest from the landscape. How does the 1601 MT GHG in purchased emission credits compare to the release of carbon through burning, elimination of the trees currently absorbing CO2 and the release of carbon in wine industry operations? Only CO2 released as part of construction is considered in the plan. A11-03 (Cont.)

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Specific Comments

Section 2

p. 52 It is very likely that this property in the northern part of Bell Canyon watershed will increase the sediment load into the Napa River which is listed for sediment. With 36" of the surface soil ripped up, the claim on page 56 that there will be no offsite transport of sediment does not seem likely to be correct. A11-04

p. 55 Although no salmonids are in streams adjacent to the site, the sediment will run downstream into waterways that do have salmonids, like the Napa River. The question is not addressed if any of the streams in the watershed between this property and the Napa R. are potential salmonid habitat or good for spawning. A11-05

p. 58 Integrated Pest Management – However carefully applied, herbicides and pesticides will find their way into the watershed and increase their levels compared to having no vineyard on the property. Guidelines for their use are written by the manufacturer to serve their needs, not to protect people drinking the water or fish living in it. A11-06

p. 69 Girdling ghost pine and leaving cut manzanita in place as described in this section increases fire danger on the property. Leaving black oak is also a fire problem because this tree is susceptible to SOD and when it dies will increase the fuel load. A11-07

Section 3

p. 87 Is the information in this section of the plan an integral part of the plan describing part of the landowner commitment? This section is titled "Support Documentation". A11-08

p. 95 On this page the claim is made that since no environmental impacts exist, feasible alternatives are not considered that modify the plan to lessen disturbance to the current partially forested state of the property. A11-09

Pgs 95..97 Straw man alternatives are established and disposed of in this section. Although all alternatives cannot be considered, obvious feasible alternatives such as vineyard only on an unforested portion of property are not considered. It is legally necessary to examine feasible alternatives, not straw man alternatives. Specifically, replanting a similar equal area on the property was also not considered as a mitigation alternative and adopting lower impact viticultural practices were not considered. A11-10

Section 4

p. 120 Traffic impacts are considered but limited only to logging, how about traffic impacts from the vineyard operation? The cumulative impacts of both is not considered. A11-11

App I Timberland Conversion Section

I-9 It is stated that the land will be returned to timber production if conversion fails. How will this be done? Is the landowner responsible for removal of the vineyard, which is a fire hazard and is necessary to eliminate it as a source of pests for neighboring vineyards? Will replanting be done to restore the forested portion of the property? A11-12

I-12 Describes fencing on the property. Will it permit wildlife movement? Can existing barbed wire be removed to facilitate wildlife movement since the vineyard blocks themselves will be fenced? This property is between two arms of Napa Land Trust property (pg. 126). A11-13

I-13 States there is no recreation value of the property even though it is adjacent to Napa Valley Land Trust property (pg. 126). A11-14

I-14 It is stated there is no water development as part of the property. Isn't there a resevoir as described in the earthquake appendix? Does this mean there will be no new wells drilled? A11-15

I-24 Describes water usage for the vineyard as follows:

3000 vines/acre
40 g/vine when established
80 g/vine to establish
3.8 af/yr when established
7.6 af/yr to establish

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A11-16

This does not consider the life of the vines, typically 15 years or the annual water usage to establish the initial vines or re-establish them thereafter in calculating the average annual water use. This presumably considers only average rainfall, irrigation will be higher during drought conditions.

I-53 States the Philosophy of the Landowners. Are these admirable goals an integral binding part of the plan? If so, who is responsible for monitoring and enforcement? If not, why are they even mentioned here? A11-17

I-54 Water Management. It is stated all water use will be monitored. Will this be reported to government agencies, as required by law?

I-54 Water Management. It is stated that the minimum amount of water will be used to produce "premium quality wine". Some of the best wines are dry-farmed, for example as in France. Isn't this really a yield issue, not a grape quality issue? Yield is obviously the major unstated factor in water use on this property. A11-18

I-56 It is stated on this page that no herbicides will be used on the vineyard. It is very commendable that no herbicides will be used. Is this a binding part of the plan, which will apply to any future owners?

I-57 It is stated here that the carcinogen Roundup will be used, in contradiction to the statement on the previous page. Which is correct? Has the drift of Roundup in the wind when it is applied been considered? California is about to require labeling of Roundup as a potential carcinogen. A11-19

I-62 and following. The forested area in the photographs looks very healthy and should be kept intact to prevent erosion and trap water, not cut. Isn't there open rangeland suitable for a vineyard? A11-20

App O Water Demand and Availability

O-1 States that 2.93 acre/ft per year will be used by the vineyard. Why is this different from the previous figure presented on page I-24? Which is correct?

O-1 States that the annual water usage is only 24% of the rainfall on the property, thus is OK. This conclusion is erroneous both logically and scientifically because it does not consider that the irrigation required is in ADDITION to the rainfall on the vineyard. It also does not consider that the aquifer is not necessarily recharged from the ground immediately above it. This analysis also ignores the holding capacity of the trees that will be cut and the shade they provide which reduces the evaporation rate. Lastly, it ignores the well established weather pattern in California in which droughts last years, as we are experiencing now. This will require water extraction far in excess of rainfall over a 5 year drought timeframe. Thus the essential logic that water withdrawals are OK as long as they are less than average annual rainfall is flawed and leads to unsustainable levels of water use that will impact downstream water users. A11-21

Sincerely,

Dr. John W. Cruz

Forest Unlimited Logging Review Program Manager

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David Morrison
Director

October 8, 2015

Bill Solinsky
CAL FIRE
Division of Resource Management
P.O. Box 944246
Sacramento, CA 94244-2460

RE: **Draft Environmental Impact Report Comments, SCH#2014062076, 1-15-081NAP**
Frostfire Vineyards II LLC Vineyard Conversion: File No. P13-00373-ECPA
Friesen Road: APN 018-060-012 & -013

Dear Mr. Solinsky:

Thank you for the opportunity to comment on the draft Environmental Impact Report (Draft EIR) that was prepared for the Frostfire Vineyards II LLC (Friesen) Vineyard Conversion and Timber Harvest Plan Application (THP/TCP). The project involves the conversion of approximately 14 acres of coniferous forest, oak woodland, and chaparral to vineyard under Erosion Control Plan P13-00373-ECPA (ECP). Of this, approximately 10 acres consists of timberland and will be harvested under the THP/TCP.

As recognized by the Draft EIR, the Napa County General Plan has adopted Goals and Policies related to the conservation of natural resources and open space preservation. Some elements of the proposed project appear to be inconsistent with those Goals and Policies. If the proposed project cannot be found consistent with Napa County's General Plan Policies, the County may not be in a position to approve the project. In November 2013 our department requested additional information about the proposed projects effect on, among other things, biological resources. The County requested professional biological consideration of the proposed project site and setting, and a recommendation on how the project would comply with applicable regulatory requirements and environmental policies. The requested biological resources considerations included the potential loss of ponderosa pine forest, oak woodland retention, impacts to special status species including Napa Lomatium (*Lomatium repostum*) and Western Pond Turtle (WPT), and the resulting reductions in wildlife movement. The Draft EIR does not provide sufficient analysis of impacts to significant resources and consistency with Napa County regulations and policies. A12-01

Outlined below are portions of the Draft EIR and the corresponding General Plan policies where the greatest inconsistencies were identified:

- Policy CON-24: Maintain and improve oak woodland habitat to provide for slope stabilization, soil protection, species diversity, and wildlife habitat through appropriate measures including one or more of

the following: a) Preserve, to the extent feasible, oak trees and other significant vegetation that occur near the heads of drainages or depressions to maintain diversity of vegetation type and wildlife habitat as part of agricultural projects. b) Comply with the Oak Woodlands Preservation Act (PRC Section 21083.4) regarding oak woodland preservation to conserve the integrity and diversity of oak woodlands, and retain, to the maximum extent feasible, existing oak woodland and chaparral communities and other significant vegetation as part of residential, commercial, and industrial approvals. c) Provide replacement of lost oak woodlands or preservation of like habitat at a 2:1 ratio when retention of existing vegetation is found to be infeasible. Removal of oak species limited in distribution shall be avoided to the maximum extent feasible. d) Support hardwood cutting criteria that require retention of adequate stands of oak trees sufficient for wildlife, slope stabilization, soil protection, and soil production be left standing. e) Maintain, to the extent feasible, a mixture of oak species which is needed to ensure acorn production. Black, canyon, live, and brewer oaks as well as blue, white, scrub, and live oaks are common associations. A12-01 (Cont.)

Discussion: The biological analysis in the Draft EIR appears inconsistent with Napa County Conservation Policy CON-24 because the project as mitigated doesn't avoid oak woodlands to the greatest extent feasible. Policy CON-24 requires the replacement of lost oak woodlands or preservation of like habitat at a 2:1 ratio when retention of existing vegetation is found to be infeasible. No evidence of infeasibility was provided with the Draft EIR. Furthermore, on Page 33 of the revised report, the biologist states that tree retention should be achieved, to the maximum extent feasible, of existing oak woodland communities.

Similar to the discussion on Page 5-3 of the Draft EIR which states that the No Timber Alternative would generally meet project objectives because it would allow for conversion of a portion of the project site to vineyard, retention of a greater amount of oak woodlands along the perimeter of the proposed project would appear to be feasible to further avoid impacts to oak woodland while still meeting project objectives. Since Policy CON - 24 requires first and foremost preservation and avoidance to the extent feasible, the oak woodlands particularly along the edges of the project, should be avoided due to their high value. Areas of the proposed project site that exhibit valuable and diverse woodland habitats are mapped with Figure 4.4-1 of the Draft EIR and should be prioritized for avoidance. These include locations along the western edge of the project boundary, the whole area of Proposed Block A (which only contains 0.15 acre of vineyard), the area between Proposed Blocks A & B along both sides of the adjacent blue-line stream, which would benefit from a greater setback buffer, and the area between Proposed Blocks C and D. A12-02

Additionally, the project is inconsistent with Policy CON-24 because it fails to address the potential loss of habitat and biological diversity associated with both the project itself and Mitigation Measure 4.4-1, which involves the implementation of a Habitat Retention Area (HRA). The forest area subject to the proposed HRA is proposed to be managed in a way that removes gray pine and manzanita from within the mixed oak woodlands to promote the remaining oak trees, ultimately simplifying the woodland from a species diversity perspective. However, a primary reason oak woodlands are preferred for preservation is because of their biological diversity and the associated wildlife value. Removal of the other species within the habitat type would likely reduce that biodiversity, particularly including native manzanita chaparral. Proposed Blocks B and D both contain large populations of manzanita chaparral. Removing the manzanita from both the project area and the surrounding area, would involve a large loss in chaparral habitat. A12-03

While the Draft EIR relies on the HRA to reduce impacts to less than significant levels, the biological report for the project does not contain any reference or discussion of the proposed HRA, so it appears that the project biologist did not formally comment on the effectiveness of the mitigation to reduce or avoid impacts or whether there may be impacts associated with the mitigation actions themselves. Based on the map provided, identified as Figure 4.4-3, the HRA proposes removal of vegetation on steep slopes and near a mapped blue line stream within the required stream setback, which is not permitted by Sections 18.108.025 and 18.108.060

of the Napa County Code without an exemption or exception. The proposed vegetation removal may also be problematic from a water quality standpoint based on the potential earthmoving caused by vegetation clearing near streams. The potential impacts of vegetation clearing on steep slopes near and within stream setbacks were not addressed in the water quality section of the Draft EIR. A12-03 (Cont.)

Mitigation Measure 4.4-1 is also inconsistent with Policy CON-24 because it does not preserve oak woodlands at the heads of drainages as described by Policy CON-24(a.). The proposed ECP should be revised to avoid all drainages and topographic depressions which are at the heads of drainages, to avoid impacts to downstream resources, and to maintain diversity of vegetation type and wildlife habitat as part of agricultural projects. The northern strip of Proposed Block D (a triangular shaped area approximately 0.5 acre in size) is within a drainage/depression which is at the head of a drainage that connects eventually downstream to a blue line tributary to Bell Canyon Creek. The west side of Proposed Block B has a depression that begins to exhibit drainage concentration above the blue line stream and should be avoided within an increased stream buffer (as referenced above for oak woodland avoidance). In addition, the southeast corner of Proposed Block C begins to exhibit steep slopes below the 2080 foot elevation line. This corner is the steepest and most susceptible to erosion to downstream drainages. A12-04

- Policy CON-18: To reduce impacts on habitat conservation and connectivity: a) In sensitive domestic water supply drainages where new development is required to retain between 40 and 60 percent of the existing (as of June 16, 1993) vegetation onsite, the vegetation selected for retention should be in areas designed to maximize habitat value and connectivity. b) Outside of sensitive domestic water supply drainages, streamlined permitting procedures should be instituted for new vineyard projects that voluntarily retain valuable habitat and connectivity, including generous setbacks from streams and buffers around ecologically sensitive areas. c) Preservation of habitat and connectivity of adequate size, quality, and configuration to support special-status species should be required within the project area. The size of habitat and connectivity to be preserved shall be determined based on the specifics needs of the species. d) The County shall require discretionary projects to retain movement corridors of adequate size and habitat quality to allow for continued wildlife use based on the needs of the species occupying the habitat. e) The County shall require new vineyard development to be designed to minimize the reduction of wildlife movement to the maximum extent feasible. In the event the County concludes that such development will have a significant impact on wildlife movement, the County may require the applicant to relocate or remove existing perimeter fencing installed on or after February 16, 2007 to offset the impact caused by the new vineyard development. f) The County shall disseminate information about impacts that fencing has on wildlife movement in wild land areas of the County and encourage property owners to use permeable fencing. g) The County shall develop a program to improve and continually update its database of biological information, including identifying threats to wildlife habitat and barriers to wildlife movement. h) Support public acquisition, conservation easements, in-lieu fees where on-site mitigation is infeasible, and/or other measures to ensure long-term protection of wildlife movement areas. A12-05

Discussion: The project appears inconsistent with Napa County General Plan Policy CON-18 for a number of reasons. As it relates to potentially significant impacts to Western Pond Turtle (WPT), the analysis in the Draft EIR is inadequate and seemingly contradictory. Therefore the county is unable to determine the extent of potential impacts to this sensitive species and in turn whether or not the project is consistent with Policy CON-18(c.). WPT presence is documented in close proximity to the project footprint and immediately adjacent to the sole project access point and one of the two project water supply wells. The project biological report says on Page 28, there is no need for protective measures for WPT for reasons such as: available upland habitat surrounding the unnamed reservoir; it is unlikely that turtles would move into or use the proposed vineyard block habitat; and the project site is down slope from the reservoir and separated by Friesen Drive a private right of way open to the public. It is not clear from this statement why the presence of Friesen Drive,

or whether it is public or private, matters with regard to impacts on movement of WPT. Friesen Drive is a gravel roadway approximately 12 feet wide that is surrounded by undeveloped open space. (Please see the attached photograph of Friesen Drive in this location.) There is currently only one permanent single family residence at the end of the road. The Draft EIR apparently assumes that since there is a 12 foot wide gravel road there, there is no opportunity for movement of WPT across the road. An assumption that there is no impact to WPT based on the presence of Friesen Road would be lacking substantiation.

The Draft EIR did not evaluate the Wild Lake reservoir or any connection the two nearby reservoirs may have for turtle populations. The Draft EIR finds that since the pond itself is not proposed for development, that there is no significant impact on turtles. However, the summary of Western Pond Turtle (WPT) on Page 4.4-40 of the Draft EIR says "the reservoir and surrounding areas provide suitable habitat for WPT; however, suitable habitat is not found within the project footprint." The Draft EIR summary for WPT says that WPT nest in upland habitat as much as almost 1,400 feet from water, so it is not clear why the Draft EIR finds that the project footprint has no possible habitat, when the entire project is located within 1,400 feet of both of the adjacent reservoirs. The last statement of the WPT summary on Page 4.4-40 says there might be suitable habitat in the Wild Lake Reservoir; however, the reservoir is 230 feet away from proposed project activities and there is no hydrologic connectivity between the onsite reservoir and Wild Lake Reservoir. On the contrary, both reservoirs fall within the terrestrial range of nesting WPT and the natural topography would have the downstream tributaries connect south of the project site absent the historic canal feeding Friesen Lakes, a structure which currently wouldn't prevent WPT movement. There is cause to believe WPT currently utilizes the proposed project site during migration and nesting and a protocol level survey for WPT is necessary. A12-05 (Cont.)

Potential impacts to WPT are required to be discussed pursuant to CEQA; however, these potential impacts haven't been adequately studied or mitigated. The summary for WPT states that part of the reason they are in decline is because of habitat alteration caused by agricultural development. Implementing the ECP without avoidance of WPT habitat and adequate corridors would be a potentially significant impact to WPT. At the minimum, an adequate wildlife corridor through the project from east to west connecting the two WPT habitat ponds would be needed to minimize impacts to WPT. Wildlife movement corridors would also allow for benefits resulting from avoidance of oak woodlands (pursuant to Policy CON-24).

The project is also essentially inconsistent with Policy CON-18(e.) referenced on Page 4.4-8 of the Draft EIR, yet the Draft EIR says there will be no impact to wildlife movement. Impact 4.4-1, and the associated Mitigation Measure 4.4-1 fails to adequately address Policy CON – 18, which focuses on habitat connectivity and conservation as well as the minimization of the reduction of wildlife movement to the maximum extent feasible for new vineyard projects. The project site is located adjacent on both east and west sides to the natural preserve called Wild Lake Ranch. The preserve is documented to be home to an abundance of wildlife species including the largest native terrestrial animal in the region, black bear. Absent in both the biological report and the Draft EIR is mention or consideration of the black bear. While the black bear is not an officially listed protected species, its large size and habitat requirements can only be met by vast wildlands. The Wild Lake Preserve and the adjacent protected lands are one of a limited number of black bear nursery sites in Napa County. These large terrestrial animals should be expected to have some conflict with agricultural operations, especially if the project is designed to include the access road. As proposed, bears would be able to walk into the vineyard and the fencing may trap the bears and other terrestrial wildlife, especially during harvest. The current fencing plan would be likely to impact both the proposed vineyard and bears. The project wildlife exclusion fencing should be revised to be consistent with the project biological report, which clearly states that the project Deer Fencing should be designed with exit gates and limited to vineyard blocks only. To the contrary, the proposed deer fencing as shown on the site plan encompasses both the proposed vineyard A12-06

and the access road that leads to the single family residence about 2,000 feet south of the project site. The current vineyard design maximizes vineyard development, maintains the current level of accessibility to the neighboring property, and gives convenient access to the Proposed Project; however, it does not address conflicts between the project and wildlife movement. For context on the remoteness of the project location and the surrounding wilderness, please see Figure 4.1-1, Project Viewshed; and Figure 4.2-1, Farmland Mapping in the Draft EIR.

Similar to protections for wildlife movement provided by Policy CON-18, Napa County Policy CON-2 and Policy CON-19 also protect wildlife habitat and connectivity.

As currently proposed the vineyard development and wildlife exclusion fencing would be inconsistent with Napa County Policy CON-2: *(The County shall identify, improve, and conserve Napa County's agricultural land through the following measures: c) Require that existing significant vegetation be retained and incorporated into agricultural projects to reduce soil erosion and to retain wildlife habitat. When retention is found to be infeasible, replanting of native or non-invasive vegetation shall be required.)* and, Napa County Policy CON-19: *(The County shall encourage the preservation of critical habitat areas and habitat connectivity through the use of conservation easements or other methods as well as through continued implementation of the Napa County Conservation Regulations associated with vegetation retention and setbacks from waterways).* A12-06 (Cont.)

In the pre-project condition wildlife movement is completely unencumbered and in the post-project condition wildlife movement would be significantly deterred. In order to avoid impacts to wildlife movement, the project would need to provide an east-west corridor linking the two existing preserve properties located immediately east and west of the project along the existing gravel road, disconnect the residential gravel access road from the project, adequately buffer the western edge of the property heading north-south from the project site, and provide separation of Proposed Blocks C & D (which would also serve to avoid oak woodland).

- Policy CON-6: The County shall impose conditions on discretionary projects which limit development in environmentally sensitive areas such as those adjacent to rivers or streamside areas and physically hazardous areas such as floodplains, steep slopes, high fire risk areas and geologically hazardous areas.
- Policy CON-50: The County will take appropriate steps to protect surface water quality and quantity, including the following: a) *Preserve riparian areas through adequate buffering and pursue retention, maintenance, and enhancement of existing native vegetation along all intermittent and perennial streams through existing stream setbacks in the County's Conservation Regulations (also see Policy CON-27 which retains existing stream setback requirements).*
- Policy CON-53: The County shall ensure that the intensity and timing of new development are consistent with the capacity of water supplies and protect groundwater and other water supplies by requiring all applicants for discretionary projects to demonstrate the availability of an adequate water supply prior to approval. Depending on the site location and the specific circumstances, adequate demonstration of availability may include evidence or calculation of groundwater availability via an appropriate hydrogeologic analysis or may be satisfied by compliance with County Code "fair-share" provisions or applicable State Law. In some areas, evidence may be provided through coordination with applicable municipalities and public and private water purveyors to verify water supply sufficiency. A12-07

Discussion: Impact 4.9-4, and the associated Mitigation Measure 4.9-4 related to Groundwater supplies states that there will be a less than significant impact, and no mitigation will be required. However, the ECP site plan shows one of the two new wells located immediately adjacent to the unnamed reservoir on-site, east of the project site. The on-site reservoir should be considered an environmentally sensitive area. Placement of the new well immediately adjacent to the existing reservoir brings into question the hydrogeologic connectivity of

the well to the reservoir. If the proposed well water pumping for the proposed vineyard draws down the water levels in the adjacent reservoir, aquatic habitat for WPT in the pond would be negatively impacted. The Draft EIR should include a discussion and analysis of this potential impact. If significant, the Draft EIR should include mitigation to prevent depletion of water from the unnamed reservoir on-site. A12-07 (Cont.)

- Policy CON-17: Preserve and protect native grasslands, serpentine grasslands, mixed serpentine chaparral, and other sensitive biotic communities and habitats of limited distribution. The County, in its discretion, shall require mitigation that results in the following standards: a) Prevent removal or disturbance of sensitive natural plant communities that contain special-status plant species or provide critical habitat to special-status animal species. b) In other areas, avoid disturbances to or removal of sensitive natural plant communities and mitigate potentially significant impacts where avoidance is infeasible. c) Promote protection from overgrazing and other destructive activities. d) Encourage scientific study and require monitoring and active management where biotic communities and habitats of limited distribution or sensitive natural plant communities are threatened by the spread of invasive non-native species. e) Require no net loss of sensitive biotic communities and habitats of limited distribution through avoidance, restoration, or replacement where feasible. Where avoidance, restoration, or replacement is not feasible, preserve like habitat at a 2:1 ratio or greater within Napa County to avoid significant cumulative loss of valuable habitats. A12-08

Discussion: Impact Statement 4.4-3 states that the overall removal of Napa Lomatium can be mitigated by seed bank retention and transplantation, if ecologically suitable locations are identified by a professional biologist. In order to verify if this would be a feasible mitigation, the biologist should be consulted in advance of adoption of the Draft EIR to verify ecological conditions do in fact exist nearby that would suitable, and those mitigations would not also cause their own impacts. In order to know if proposed Mitigation Measure 4.4-3 will effectively avoid to the extent feasible the loss of Napa Lomatium, the project biologist must comment and analyze if this mitigation would be effectively consistent with Policy CON-17(e).

Alternatives:

Regarding the discussion of Alternatives to the Proposed Project, it is unclear why the only project alternatives given consideration under Section 5-5 is the No Project Alternative and the No Timber Conversion Alternative. If the goal of the project is 13.8 acres of vineyard, it appears from Napa County's perspective that it would be at least feasible to proceed with an alternative that produced a vineyard of less total acreage with increased environmental protections consistent with the Napa County General Plan and Conservation Regulations that would result in a vineyard, timber removal, and an environmentally superior design. The Draft EIR is inadequate because it has no impact analysis of the environmental effects of the proposed HRA. The Draft EIR states that the remainder of the property would be preserved *de facto* by existing land use regulations; however, additional proposals are reasonably foreseeable to come forward in the future including all of the normal allowances of the zoning ordinance on both of the two project parcels such as multiple single family residences on each parcel, accessory buildings, and possibly other land uses that require a Use Permit, such as a winery or more vineyard on slopes over 30%. It is reasonably foreseeable that the property owner would want to construct a barn for tractor equipment to manage the proposed new vineyard. However, the proposed project as mitigated assumes environmental protections based on leaving the rest of the project parcel in its natural condition and/or managed and altered by the HRA. The Draft EIR does not propose to use mitigation as a way to ensure the protections that are assumed through *de facto* preservation. The Draft EIR should consider the whole of the project, including future agricultural accessory structures for the vineyard, as well as potential future single family residences, other accessory buildings, and other land uses allowed by the zoning ordinance. If it is the intention of the project proponents to encumber the property from further development through more formal means such as a conservation easement it A12-09

should be proposed with the project, or otherwise implemented as mitigation through the Draft EIR. The Draft EIR should not assume *de facto* protections of significant environmental resources as the basis for the assumption of no impact or less than significant impacts. A12-09 (Cont.)

On Page 5-5, the Summary of Environmental Impacts discussion claims that not implementing the project would also mean not implementing the proposed Habitat Retention Area (HRA) and the enhancement of some of the areas of the project not proposed for development. It claims that for the No Timber Conversion project alternative, "in considering the above outcomes of this alternative, impacts to biological resources would be greater in the long term when compared to those of the Proposed Project." The No Timber Conversion project alternative would still be subject to Napa County Conservation Regulations requirements and Napa County General Plan Policies such as Policy CON-18 and CON-24. It seems far-fetched for the Draft EIR to assume that leaving a forest in its existing condition is a lesser biological environmental impact than removing the forest and converting the land to a vineyard with all its associated activities and improvements. A12-10

As stated in our letter to Cal Fire on July 24, 2014, a CEQA document that does not adequately disclose and assess potential impacts of the entirety of the project could result additional environmental review when the County conducts its discretionary review of the associated ECP permit noted above, which could result in delays to the applicant and project implementation, as well as, potential project modifications. Similarly, if the proposed project and the mitigations resulting from the Draft EIR are inconsistent with the policies and regulations of the Napa County General Plan and Conservation Regulations then Napa County may not be able to approve the project as proposed. As such, the County would like you to consider the above comments regarding the Draft EIR for the referenced application.

Thank you for the opportunity to review and comment on the Draft EIR. If you should have any questions regarding any of the above issues, please don't hesitate to contact Brian Bordona at 707/259-5935, or brian.bordona@countyofnapa.org; and/or Daniel Zador at 707/259-8239, or daniel.zador@countyofnapa.org.

Sincerely,

A12-11

Daniel Zador
Planner II
Planning Building and Environmental Services

cc David Morrison – Director
Brian Bordona – Supervising Planner, Conservation Division
Project file

Enclosures:
Exhibit A: Photo of Friesen Drive at unnamed pond
Attachment A: List of Applicable Napa County General Plan Goals and Policies

Attachment A

Below is a review of the relevant Napa County General Plan Goals we feel should be considered in conjunction with the Draft EIR:

- Goal CON-1: The County of Napa will conserve resources by determining the most appropriate use of land, matching land uses and activities to the land's natural suitability, and minimizing conflicts with the natural environment and the agriculture it supports.
- Goal CON-2: Maintain and enhance the existing level of biodiversity.
- Goal CON-3: Protect the continued presence of special-status species, including special-status plants, special-status wildlife, and their habitats, and comply with all applicable state, federal, or local laws or regulations.
- Goal CON-4: Conserve, protect, and improve plant, wildlife, and fishery habitats for all native species in Napa County.
- Goal CON-5: Protect connectivity and continuous habitat areas for wildlife movement.
- Goal CON-6: Preserve, sustain, and restore forests, woodlands, and commercial timberland for their economic, environmental, recreation, and open space values.
- Goal CON-7: Identify and conserve areas containing significant mineral deposits for future use and promote the reasonable, safe, and orderly operation of mining and extraction and management activities, where environmental, aesthetic, and adjacent land use compatibility impacts can be adequately addressed.

Of the Policies adopted to achieve those Goals of the Napa County General Plan, those that appear the most inconsistent with elements of the project as proposed include (with the most applicable item italicized):

- Policy CON-18: To reduce impacts on habitat conservation and connectivity: a) *In sensitive domestic water supply drainages where new development is required to retain between 40 and 60 percent of the existing (as of June 16, 1993) vegetation onsite, the vegetation selected for retention should be in areas designed to maximize habitat value and connectivity.* b) Outside of sensitive domestic water supply drainages, streamlined permitting procedures should be instituted for new vineyard projects that voluntarily retain valuable habitat and connectivity, including generous setbacks from streams and buffers around ecologically sensitive areas. c) *Preservation of habitat and connectivity of adequate size, quality, and configuration to support special-status species should be required within the project area. The size of habitat and connectivity to be preserved shall be determined based on the specifics needs of the species.* d) *The County shall require discretionary projects to retain movement corridors of adequate size and habitat quality to allow for continued wildlife use based on the needs of the species occupying the habitat.* e) *The County shall require new vineyard development to be designed to minimize the reduction of wildlife movement to the maximum extent feasible. In the event the County concludes that such development will have a significant impact on wildlife movement, the County may require the applicant to relocate or remove existing perimeter fencing installed on or after February 16, 2007 to offset the impact caused by the new vineyard development.* f) The County shall disseminate information about impacts that fencing has on wildlife movement in wild land areas of the County and encourage property owners to use permeable fencing. g) The County shall develop a program to improve and continually update its database of biological information, including identifying threats to wildlife habitat and barriers to wildlife movement. h) Support public acquisition, conservation easements, in-lieu fees where on-site mitigation is infeasible, and/or other measures to ensure long-term protection of wildlife movement areas.
- Policy CON-24: Maintain and improve oak woodland habitat to provide for slope stabilization, soil protection, species diversity, and wildlife habitat through appropriate measures including one or more of the following: a) *Preserve, to the extent feasible, oak trees and other significant vegetation that occur near the heads of drainages or depressions to maintain diversity of vegetation type and wildlife habitat as part of agricultural projects.* b) Comply with the Oak Woodlands Preservation Act (PRC Section 21083.4) regarding oak woodland preservation to conserve the integrity and diversity of oak woodlands, and retain, to the maximum extent feasible, existing oak woodland and chaparral communities and other significant vegetation as part of residential, commercial, and industrial approvals. c) *Provide replacement of lost oak woodlands or preservation of like habitat at a 2:1 ratio when retention of existing vegetation is found to be infeasible.* Removal of oak species limited in distribution shall be avoided to the maximum extent feasible. d) Support hardwood cutting criteria that require retention of adequate stands of oak trees sufficient for wildlife, slope stabilization, soil protection, and soil production be left standing. e) Maintain, to the extent feasible, a mixture of oak species which is needed to ensure acorn production. Black, canyon, live, and brewer oaks as well as blue, white, scrub, and live oaks are common associations. f) Encourage and support the County Agricultural Commission's enforcement of state and federal regulations concerning Sudden Oak Death and similar future threats to woodlands.
- Policy CON-17: Preserve and protect native grasslands, serpentine grasslands, mixed serpentine chaparral, and other sensitive biotic communities and habitats of limited distribution. The County, in its discretion, shall require mitigation that results in the following standards: a) *Prevent removal or disturbance of sensitive natural plant communities that contain special-status plant species or provide critical habitat to special-status animal species.* b) In other areas, avoid disturbances to or removal of sensitive natural plant communities and mitigate potentially significant impacts where avoidance is infeasible. c) Promote protection from overgrazing and other destructive activities. d) Encourage scientific study and require monitoring and active management where biotic communities and habitats of limited distribution or sensitive natural plant communities are threatened by the spread of invasive non-native species. e) Require no net loss of sensitive biotic communities and habitats of limited distribution through avoidance, restoration, or replacement where feasible. Where avoidance, restoration, or replacement is not feasible, preserve like habitat at a 2:1 ratio or greater within Napa County to avoid significant cumulative loss of valuable habitats.
- Policy CON-6: *The County shall impose conditions on discretionary projects which limit development in environmentally sensitive areas such as those adjacent to rivers or streamside areas and physically hazardous areas such as floodplains, steep slopes, high fire risk areas and geologically hazardous areas.*

- Policy CON-9: The County shall pursue a variety of techniques and practices to achieve the County's Open Space Conservation policies, including: a) Exclusive agriculture zoning or Transfer of Development Rights. b) Acquisition through purchase, gift, grant, bequest, devise, lease, or otherwise, the fee or any lesser interest or right in real property. c) Williamson Act or other incentives to maintain land in agricultural production or other open space uses. d) *Requirements for mitigation of development impacts, either on-site or at other locations in the county or through the payment of in-lieu fees in limited circumstances when impacts cannot be avoided.*
- Policy CON-2: The County shall identify, improve, and conserve Napa County's agricultural land through the following measures: c) *Require that existing significant vegetation be retained and incorporated into agricultural projects to reduce soil erosion and to retain wildlife habitat. When retention is found to be infeasible, replanting of native or non-invasive vegetation shall be required.* e) Encourage inter-agency and inter-disciplinary cooperation, recognizing the agricultural commissioner's role as a liaison and the need to monitor and evaluate pesticide and herbicide programs over time and to potentially develop air quality, wildlife habitat, or other programs if needed to prevent environmental degradation.
- Policy CON-19: The County shall encourage the preservation of critical habitat areas and habitat connectivity through the use of conservation easements or other methods as well as through continued implementation of the Napa County Conservation Regulations associated with vegetation retention and setbacks from waterways.
- Policy CON-20: The County shall monitor biodiversity and habitat connectivity throughout the County and apply appropriate adaptive management practices as necessary to achieve applicable Natural Resources Goals. Changing conditions may include external forces such as changing state or federal requirements, or changes in species diversity, distribution, etc.

Other Napa County General Plan Policies that are relevant to the development proposal and may be inconsistent with elements of the project as proposed include (with the most applicable item italicized):

- Policy CON-1: The County will preserve land for greenbelts, forest, recreation, flood control, adequate water supply, air quality improvement, habitat for fish, wildlife and wildlife movement, native vegetation, and natural beauty. The County will encourage management of these areas in ways that promote wildlife habitat renewal, diversification, and protection.
- Policy CON-4: *The County recognizes that preserving watershed open space is consistent with and critical to the support of agriculture and agricultural preservation goals.*
- Policy CON-7: The County shall enact and enforce regulations which maintain or improve the current level of environmental quality found in Napa County. The County shall uniformly and fairly enforce codes and regulations and shall, with respect to enforcing regulations related to environmental quality, assign high priority to abatement of violations that may constitute actual or potential threats to public health or safety or that may cause significant environmental damage. Enforcement actions shall be designed to discourage significant damage and future violations.
- Policy CON-8: *The County will use financial and other incentives to encourage voluntary dedication in easement or fee title to the County of Napa or its designee (such as a local non-profit land trust) of significant habitat areas, as appropriate, to ensure long-term protection for fish and wildlife resources and protection of agricultural lands and open space.*
- Policy CON-11: The County shall maintain and improve fisheries habitat through a variety of appropriate measures, including the following as well as best management practices developed over time (also see Water Resource Policies, below): m) *Control sediment production from mines, roads, development projects, agricultural activities, and other potential sediment sources.*
- Policy CON-13: The County shall require that all discretionary residential, commercial, industrial, recreational, agricultural, and water development projects consider and address impacts to wildlife habitat and avoid impacts to fisheries and habitat supporting special-status species to the extent feasible. Where impacts to wildlife and special-status species cannot be avoided, projects shall include effective mitigation measures and management plans including provisions to: a) Maintain the following essentials for fish and wildlife resources: 1) Sufficient dissolved oxygen in the water. 2) Adequate amounts of proper food. 3) *Adequate amounts of feeding, escape, and nesting habitat.* 4) Proper temperature through maintenance and enhancement of streamside vegetation, volume of flows, and velocity of water. b) Ensure that water development projects provide an adequate release flow of water to preserve fish populations. c) Employ supplemental planting and maintenance of grasses, shrubs and trees of like quality and quantity to provide adequate vegetation cover to enhance water quality, minimize sedimentation and soil transport, and provide adequate shelter and food for wildlife and special-status species and maintain the watersheds, especially stream side areas, in good condition. d) *Provide protection for habitat supporting special-status species through buffering or other means.* e) Provide replacement habitat of like quantity and quality on- or off-site for special status species to mitigate impacts to special-status species. f) *Enhance existing habitat values, particularly for special-status species, through restoration and replanting of native plant species as part of discretionary permit review and approval.* g) Require temporary or permanent buffers of adequate size (based on the requirements of the subject special-status species) to avoid nest abandonment by birds and raptors associated with construction and site development activities. h) Demonstrate compliance with applicable provisions and regulations of recovery plans for federally listed species.
- Policy CON-14: To offset possible losses of fishery and riparian habitat due to discretionary development projects, developers shall be responsible for mitigation when avoidance of impacts is determined to be infeasible. Such mitigation measures may include providing and permanently maintaining similar quality and quantity habitat within Napa County, enhancing existing riparian habitat, or paying in-kind funds to an approved fishery and riparian habitat improvement and acquisition fund. Replacement habitat may occur either on-site or at approved off-site locations, but preference shall be given to on-site replacement.
- Policy CON-15: The County shall establish and update management plans protecting and enhancing the County's biodiversity and identify threats to biological resources within appropriate evaluation areas, and shall use those plans to create programs to protect and enhance biological resources and to inform mitigation measures resulting from development projects.
- Policy CON-16: The County shall require a biological resources evaluation for discretionary projects in areas identified to contain or potentially contain special-status species based upon data provided in the Baseline Data Report (BDR), California Natural Diversity

Database (CNDDB), or other technical materials. This evaluation shall be conducted prior to the approval of any earthmoving activities. The County shall also encourage the development of programs to protect special-status species and disseminate updated information to state and federal resource agencies.

- Policy CON-22: The County shall encourage the protection and enhancement of natural habitats which provide ecological and other scientific purposes. As areas are identified, they should be delineated on environmental constraints maps so that appropriate steps can be taken to appropriately manage and protect them.
- Policy CON-23: The County shall work with local resource and land management agencies to develop a comprehensive approach to controlling the spread of non-native invasive species and reducing their extent on both public and private land, including developing an invasive weed ordinance. The Invasive Weed Ordinance shall include among other things regulatory standards for construction activities that occur adjacent to natural areas, including riparian and/or intermittent streams or watercourses, to inhibit the establishment of noxious weeds through accidental seed import.
- Policy CON-27: The County shall enforce compliance and continued implementation of the intermittent and perennial stream setback requirements set forth in existing stream setback regulations, provide education and information regarding the importance of stream setbacks and the active management and enhancement/restoration of native vegetation within setbacks, and develop incentives to encourage greater stream setbacks where appropriate.
- Policy CON-28: To offset possible additional losses of riparian woodland due to discretionary development projects and conversions, developers shall provide and maintain similar quality and quantity of replacement habitat or in-kind funds to an approved riparian woodland habitat improvement and acquisition fund in Napa County. While on-site replacement is preferred where feasible, replacement habitat may be either on-site or off-site as approved by the County.
- Policy CON-50: The County will take appropriate steps to protect surface water quality and quantity, including the following: a) *Preserve riparian areas through adequate buffering and pursue retention, maintenance, and enhancement of existing native vegetation along all intermittent and perennial streams through existing stream setbacks in the County's Conservation Regulations (also see Policy CON-27 which retains existing stream setback requirements).* b) Encourage flood control reduction projects to give full consideration to scenic, fish, wildlife, and other environmental benefits when computing costs of alternative methods of flood control. c) The County shall require discretionary projects to meet performance standards designed to ensure peak runoff in 2-, 10-, 50-, and 100-year events following development is not greater than predevelopment conditions. d) Maintain minimum lot sizes of not less than 160 acres in Agriculture, Watershed, and Open Space (AWOS) designated areas to reflect desirable densities based on access, slope, productive capabilities for agriculture and forestry, sewage disposal, water supply, wildlife habitat, and other environmental considerations. e) In conformance with National Pollution Discharge Elimination System (NPDES) requirements, prohibit grading and excavation unless it can be demonstrated that such activities will not result in significant soil erosion, silting of lower slopes or waterways, slide damage, flooding problems, or damage to wildlife and fishery habitats. f) Adopt development standards, in conformance with NPDES Phase II requirements, for post-construction storm water control. g) Address potential soil erosion by maintaining sections of the County Code that require all construction-related activities to have protective measures in place or installed by the grading deadlines established in the Conservation Regulations. In addition, the County shall ensure enforceable fines are levied upon code violators and shall require violators to perform all necessary remediation activities. h) Require replanting and/or restoration of riparian vegetation to the extent feasible as part of any discretionary permit or erosion control plan approved by the County, understanding that replanting or restoration that enhances the potential for Pierce's Disease or other vectors is considered infeasible. i) Encourage management of reservoir outflows (bypass flows) to maintain fish life and riparian (streamside) vegetation. j) Encourage minimal use of chemical treatment of reservoirs to prevent undue damage to fish and wildlife resources. k) Prohibit new septic systems in areas where sewage treatment and disposal systems are available and encourage new sewage treatment and disposal systems in urbanized areas where there is high groundwater recharge potential and existing concentrations of septic systems.
- Policy CON-53: The County shall ensure that the intensity and timing of new development are consistent with the capacity of water supplies and protect groundwater and other water supplies by requiring all applicants for discretionary projects to demonstrate the availability of an adequate water supply prior to approval. Depending on the site location and the specific circumstances, adequate demonstration of availability may include evidence or calculation of groundwater availability via an appropriate hydrogeologic analysis or may be satisfied by compliance with County Code "fair-share" provisions or applicable State Law. In some areas, evidence may be provided through coordination with applicable municipalities and public and private water purveyors to verify water supply sufficiency.

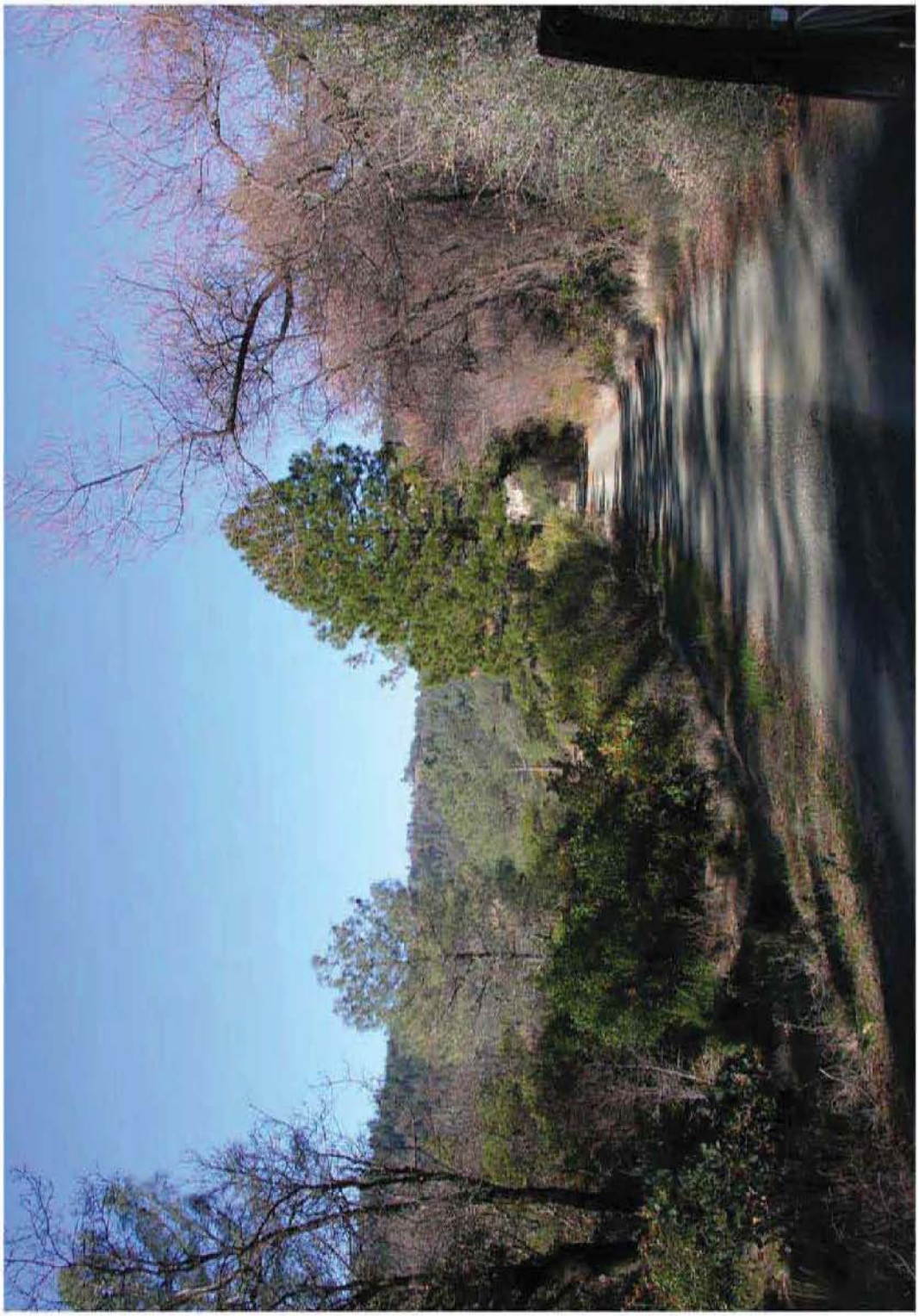

Exhibit A: Photo of Friesen Drive at unnamed pond (*looking west*)

UNIT, ~~FG, WQ~~, ER, , RPF

Santa Rosa Public Comment@CALFIRE

From: Tibby Elgato <chinacat1970@gmail.com>
Sent: Saturday, November 07, 2015 9:21 AM
To: Santa Rosa Public Comment@CALFIRE
Subject: Comments on 01-15-081 NAP
Attachments: AngwinComments.pdf

Please have the attached comments added to the public record for the THP 01-15-081 NAP.

Thank you,
John W. Cruz Ph.D.
Forest Unlimited Logging Review Program Manager

A13-01

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NOV -9 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

PO Box 506 • Forestville CA 95436 • 707.632.6070

November 7, 2015
Director, CalFire
135 Ridgeway Ave.
Santa Rosa, Ca 95402

Dear Director,

Please add the following comments to the public record for THP 01-15-081 NAP.

On 4/23/15 at the Continuation Review for the 1-13-126NAP Anthony Lukasic the review chair stated that he recommended approval for the project even though neither he or staff had not completed analysis of public comments. He also stated that this was standard CalFire practice which is obvious from the process which extends the public comment period past the Second Review. A recommendation for approval will generally be made at the Second Review. As with many logging plans, this plan had numerous substantive public comments from attorneys and experts in the various fields. A13-01 (Cont.)

All logging plans including the THP 01-15-081 NAP follow this process which is to recommend approval at the Second Review and answer public comments later. There is a real possibility that the public will raise critical issues that will impact the proposed logging plan. Often people living close to the logging area have the most critical insights.

This CalFire process is legally flawed because it does not permit the public to have a meaningful impact on the approval of logging activities. Recommendation for approval (or disapproval) should be deferred until all public comments have been answered in detail. The current process is also flawed because it gives the impression that CalFire is ignoring public comment. This has the effect of discouraging public comment and involvement in this activity of their government.

Sincerely,
John W. Cruz, Ph.D.

Forest Unlimited Logging Review Program Manager

RECEIVED
NOV -9 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

UNIT, ~~FG, WQ~~, ER, , RPF

Santa Rosa Public Comment@CALFIRE

From:	mike hackett <mhackett54@gmail.com>
Sent:	Sunday, November 08, 2015 8:45 PM
To:	Sacramento Public Comment@CALFIRE; Santa Rosa Public Comment@CALFIRE
Subject:	THP 1-15-081 NAP
Attachments:	Last Ditch.docx

Please include the attachment held within this e-mail for input as additional Public Comment in regards to the Davis Friesen Vineyard Timber Harvest Plan/Timber Conversion Plan and DEIR in Angwin, California.

Thank you,

Mike Hackett for
Bell Canyon Watershed Alliance

A14-01

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NOV -9 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

November 7. 2015

Bell Canyon Watershed Alliance
282 S. White Cottage Rd.
Angwin, Ca. 94508

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Davis Friesen Vineyard THP/TCP/DEIR

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Davis Friesen Vineyard THP/TCP/DEIR

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California Department of Forestry and Fire Protection
Attn: Leslie Markham
135 Ridgeway Ave.
Santa Rosa, Ca. 95401

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A14-01
(Cont.)

The Bell Canyon Watershed Alliance wishes to add the following document concerning the Davis Friesen Lakes Timber Harvest Plan/ Timber Conversion Plan and DEIR:

The California Department of Forestry and Fire Protection (CAL FIRE) is the lead agency for the review of the required Environmental Impact Report for the Davis Family Estates Friesen Vineyard Proposed Project in compliance with the California Environmental Quality Act (CEQA). This is mandated because this proposed project involves not only a Timber Harvest Plan, but also a Timber Conversion Plan. Additionally, the Z'Berg Nejedly findings, in accordance with the Forest Practice Act of 1973, section 4516.6, provides the opportunity for California Counties to obtain additional rules and regulations from the Board of Forestry that take into account local needs. This is to facilitate protections for the rights of local citizens. After encountering resistance, lack of review and oversight during Mr. Lucacic's Second Review of the Project, it is clear that CEQA is NOT being followed, and the process should be halted

or at the very least, delayed, until a proper review can be conducted. Mr. Lucacic admitted to "not having read the DEIR, nor the Public Comments," which are required by the CEQA process.

Mr. Lucacic and his superior, Ms. Leslie Markham, abused their discretion in approving the project through the Second Review of the THP 1-15-081, which would allow the clearing of forest from the land for planting approximately 15 acres of vineyard. The mandated CEQA process should examine the cumulative impacts for this project, although a single page in the DEIR is devoted to this aspect. Additionally numerous legal arguments raised in Public Comment were summarily ignored that had objected to the approval of the TCP/THP, and most fundamental of all: the THP and TCP are being reviewed in far separate geographic locations, making it impossible for a citizen to properly weigh-in on the negative consequences of granting approval. A14-01 (Cont.)

The discussion must include the potentially significant soil erosion impact into Bell Canyon, the City of St. Helena's primary water source, and info the already impaired Napa River. The project opponent's Public Comments actually support a "fair argument" that significant impacts may occur and the environmental review clearly rises to the "low level" requirement which favors a thorough environmental review. When the informational requirements of CEQA are not complied with, that agency has failed to proceed in "a manner required by law" and has therefore abused its discretion. A14-02

Pursuant to the California Forest Practice Rules, a THP cannot be approved without CAL FIRE's prior approval and issuance of a legally sufficient TCP. These rules are contained in CA Code of Regulations 1106.2. Therefore if the TCP is found to be inadequate or its environmental review document is found to violate CEQA, the THP is also illegal and voidable.

I will provide arguments to this EIR and TCP/THP from the following LEGAL Comments: A14-03

1. **The Alternatives to this proposed project have not been examined.**
2. **Allowing this project would impact the already impaired Napa River.**
3. **CEQA violated due to lack of review of Public Documents that were submitted.**
4. **The GHG measurement mitigations are invalid as evidenced through the document copied within Mr. Hackett's previous submission. The document was prepared by the Quercus Group.**
5. **Most alarming is that the cumulative impacts have NOT been addressed; another clear violation of CEQA.**

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6. **This project violates the Clean Water Act. These impacts will violate section 303D of this act. Since CAL FIRE is not taking appropriate action in its review of the THP/TCP, and because these are violations of the CWA, it is well within our rights as citizens, to file a Citizens Law Suit.**
7. **The California Department of Natural Resource Agency has implementation plans which represent a master blueprint for executing actions recommended in the 2014 report Safeguarding California: Reducing Climate Risk, as called for in Governor Brown's April 2015 Executive Order (B-30-15.) These have been ignored in the CAL FIRE decisions, thus far.**

A14-03 (Cont.)

1. The Forest Practice Rules require THP's to evaluate **alternatives** to a project. The slopes on this project exceed 30 percent or greater. In fact, large areas of the Property contain slopes that exceed 50 percent. This Property is within the Bell Canyon drainage and over time, will affect the quality and quantity of City of St. Helena's water. The alternatives of No Timber Harvest and No Timber Conversions are remedies, but actual, real-life alternatives to this project that would not have negative effects are available. There are many additional parcels available within the Howell Mountain appellation that would NOT require clear-cutting of trees that are outside the Bell Canyon Watershed, that have deeper, richer soil, that would not affect the habitat corridor for the wildlife activities, and that would be viable **financially**.

   Mr. Randy Dunn, a long time successful vintner from Angwin along with a renowned large multi- vineyard property owner, and representatives from the Land Trust of Napa County, have personally demonstrated to Mr. Davis how optional alternative sites are available. With Land Trust's assistance, Mr. Davis could more than recoup his investment in this Property; and where he could make a profit growing grapes. This would be **physically** possible and eco-friendly. CEQA DEMANDS THAT A "RANGE OF FEASIBLE ALTERNATIVES MUST BE EXAMINED**, IN DEPTH**, AND IF THEY PROVIDE MITIGATIONS TO HIS CURRENT PROJECT THEY SHOULD BE UTILIZED." This has not been accomplished. Under CEQA Guidelines 15126.4 "public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects…."

A14-04

2. Drainage from the Property flows not only to Bell Canyon and it's reservoir, but also to the Napa River. The Napa River is impaired due to sediment since 1990, nutrients and pathogens since 1988 and nothing has been done by the State to

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implement a recovery program with numeric targets for reduction in sediment and nutrients. The Napa River has endangered steelhead equally distributed throughout the watershed. Sediment from this and other projects in this watershed will cause significant cumulative impacts to the endangered steelhead spawning habitats. The Bay Area Regional Water Control Board was not in attendance at the Second Review, nor did they even comment on the DEIR. They were not notified and therefore were unable to voice an opinion about how measurable sediment will get into the already impaired Napa River. Because of this impairment, Federal Law, via the Clean Water Act, provides for NO MORE sediment into it or its tributaries. The State of California has a Memorandum of Understanding that mandates compliance with that rule. The term TMDL, relates to how much total maximum daily load (sediment) is allowed. In the case of the Napa River, it's zero. This TCP violates the Clean Water Act. The Napa River is an impaired water body due to sediment, pathogens and nutrients. Warm temperatures in the streams and Napa River are causing a problem in the rearing habitats for the Steelhead. The Still Water Science on contract for the State Regional Water Quality Control Board and the Environmental Protection Agency released the Executive Summary for the Napa River Watershed Limiting Factors Analysis over ten years ago, and recommended that "no new sediment source should occur" due to the Napa River impairment status as a priority watershed declared by the 104th Congress. A14-05 (Cont.)

3. The attitude and lack of review of submitted Public Comments is an obvious **"violation of public rights and the requirement for complete information."** The CAL FIRE team displayed a **"pattern and practice that subverted the CEQA process."** Mr. Lucacic, under the guidance of Ms. Markham, was unprepared for the Second Review, and admitted to making his mind up the day before the review was held on October 29, 2015. He stated that he had only "skimmed" through the DIER and had read none of the Public Comments. How is is it possible to represent the interests of the citizens, as mandated in CEQA, without participation in the Public Comments? Even the Fish and Wildlife representative that was on speaker phone, had not read the extensive scientific research that had been presented by Mr. David Graves, and from the biologist working with the Land Trust. The Western Pond Turtles are on the Property, and they are on the "fast track" to endangered species classification. To have ignored this and other significant habitat responses from scientists involved, demonstrates a total lack of commitment to CEQA. Mr. Lucacic stated, "my job is not to focus on public comment; I will not comment on the pond turtle." He flatly stated, " ...the project has no adverse impact to the environment." A14-06

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4. I reference here, the Quercus Group's September 16, 2015 comments regarding the clear cutting of native conifers and hardwoods on the Project. Essentially, there are no mitigation measures available for this THP/TCP. Planting trees on the other section of the Property may satisfy a requirement, but the area earmarked for the tree planting has extremely thin soil; therefore the trees have a very slight chance of survival in the real world. Quercus Group is the leading authority for forest and greenhouse gas consultations in the Bay Area, and they state that the 1-15-081 THP " fails to fully account for greenhouse gas (GHG) emissions pursuant to California Environmental Quality Act project requirements. Specifically, the THP provides no analysis regarding potential indirect biogenic carbon dioxide, methane and nitrous oxide emission effects or the proportional mitigation measures. This THP omission represents a failure to proceed in the manner prescribed by CEQA." Quercus Group's response was sent to 2210 West College Avenue and is included in full detail, in my Public Comment which was submitted prior to the Second Review. A14-07

This document was prepared by Mr. Ron Cowan, Principal of Quercus, and states, once again, that the 1-15-081 NAP is deficient as an informational document, in that it fails to apprise decision-makers/public of the full range and intensity of the adverse GHG emission effects on the environment that may reasonable be expected if the project is approved."I strongly recommend that this **legal** issue be confronted prior to any further analysis regarding this project. The development of the State Forest Carbon Plan will incorporate components of actions and goals from the Plan. They mandate Forest Adaption Strategies that: Implement forest management for the overall health and protection of watersheds. Additionally, these ideals should manage California's forested landscapes to safeguard the State's water supply reliability and quality and to reduce snowpack evapotranspiration and increase water infiltration. Manage forest to reduce sold erosion and protect water quality, and account for the value of healthy watersheds and their ecosystem services and consider the avoided costs of investing in protecting and resorting these services. The development of the State Forest Carbon Plan will incorporate components of the actions and goals outlined above. It has long been recognized that California forests will play a very important role in achieving AB 32 goals. The Forest Climate Action Team (FCAT) was assembled in August of 2014 with the primary purpose of developing a forest carbon plan by the end of 2016. FCAT is comprised of Executive level members from many of the State's natural resource agencies. **FCAT is under the leadership of CAL FIRE.** A14-08

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5. In March, 2003, 2,000 cubic yards of soil washed into the Bell Canyon Watershed. The Napa County Board of Supervisors soon thereafter adopted Ordinance 1219, with it's aim to protect domestic water supplies in Napa County. This includes modifying Chapter 18.108 to better protect our County's sensitive water supplies. There have been at least three chronicled soil erosions into Bell Canyon from the distant vineyards from the Property, but that lie within Bell Canyon. We must ask: where is the" **Threshold of Significance,"** when it comes to cumulative impacts from this and future timber conversions? Can CAL FIRE determine how much the water temperature will rise in Bell Creek and the Napa River? How much is too much conversion into the watershed? CAL FIRE has no way to determine the "threshold of significance." If there are no thresholds established, they how can CAL FIRE judge the cumulative impact? This obviously applies to the Napa River, where the threshold has already been reached because it is "impaired." A14-09

6. If CAL FIRE is not taking appropriate action in it's application of the Clean Water Act, then it allows Citizen Suits. Since the THP/TCP are the equivalence of CEQA, and the Clean Water Act is being violated, then it would be well within our rights to file a law suit. Why doesn't CAL Fire know that the Napa River is listed as a high priority watershed under the Clean Water Act? Why doesn't CAL FIRE list the Napa River as a "sensitive watershed" under their own rules? The Napa River TMDL executive summary, dated June 14, 2002, and titled Napa River Basin Limiting Factors Analysis, states that there should be no new sediment sources. Since this erosion control plan is lacking in preventing sediment mobilization off site, this project should not be approved. A14-10

7. The California Natural Resource Agency has issued its report about Safeguarding California: Implementation Action Plans, October 2015, issued by the Governor, which details how California will build the resilience of our residents, communities and ecosystems to the emerging impacts of climate change. It states: " forests are our key life support system on this planet, and one that occupies a significant portion of the State: about 31 million acres of California's 100 million acres. They provide a multitude of key benefits-clean air and water, wildlife habitat, building materials, renewable energy and recreation. Climate change in California forsts is affecting tree survival and growth, forest composition, forest health and productivity, and has increased the intensity of ecosystem disturbances from A14-11

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wildfire, insects and spread of invasive species and land type conversion. These impacts result in less capacity to store carbon and more risk of greenhouse gas emissions. As a result, the current values used by CAL FIRE are obsolete, and must now account for the value of healthy watersheds and their ecosystem services and consider the avoided costs of investing in protecting and restoring these services. A14-11 (Cont.)

Climate change is the classic example of a cumulative effects problem; emissions from numerous sources combine to create the most pressing environmental and societal problem of our time. As former D.C. Circuit Judge Wald in a 1999 dissenting opinion, recently quoted with unanimous approval by the Ninth Circuit in Center for Biological Diversity v. NHTSA states: "We cannot afford to ignore even modest contributions to global warming. If global warming is the result of the cumulative contributions of myriad sources, any of modest in itself, is there not a danger to losing the forest by closing our eyes to the felling of the individual tree?" Accordingly, because the THP/TCP will contribute to greenhouse gas emissions, CAL FIRE must find the emissions a cumulatively significant impact and must reject this Project. A14-12

Conclusion: This THP/TCP process has violated CEQA, and has not complied with Napa County provisions of its General Plan. Napa County has recommended that this Project be rejected, the City of St. Helena has recommended that this project be rejected, recognized science demonstrates that this project cannot be mitigated in numerous areas, and many legal flaws have been established. The required documents must be revised and re-circulated. The flawed process coming out of CAL FIRE, Santa Rosa, is an egregious violation of our citizen rights and has left CAL FIRE open to legal action regarding its non-compliance with the Forest Practice Act and CEQA. A14-13

Very Truly Yours,

Mike Hackett for B.C.W.A.

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UNIT, ~~FG, WQ~~, ER, ~~LIM~~, ~~RPF~~

Santa Rosa Public Comment@CALFIRE

From:	April Rose Sommer <asommer@biologicaldiversity.org>
Sent:	Monday, November 09, 2015 5:01 PM
To:	Santa Rosa Public Comment@CALFIRE
Subject:	Davis THP
Attachments:	letterhead.2015.docx; attachment a.pdf

1-15-081 NAP

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CENTER for BIOLOGICAL

November 9, 2015

California Department of Forestry and Fire Protection

RE: Davis Estates, Friesen Vineyard Timber Harvest Plan No. 1-15-081 NAP

SUBMITTED BY EMAIL TO santarosapubliccomment@fire.ca.gov

Dear CalFIRE:

These comments are submitted on behalf of the Center for Biological Diversity (the "Center") on the Timber Harvest Plan for the proposed Davis Estates, Friesen Vineyard Timber Harvest Plan No. 1-15-081 NAP. The Center finds the THP, the DEIR, and this project to be legally insufficient and encourages CalFIRE to draft a THP that complies with the law.

A15-01 (Cont.)

The Center for Biological Diversity is a nonprofit, public interest environmental organization dedicated to the protection of endangered species and wild places through science, policy, and environmental law. The Center represents the interest of its 50,822 members and over 800,000 online activists throughout the country and 31,862 members and 111,877 California online activists.

THPs are subject to the California Environmental Quality Act ("CEQA") which mandates that the environmental impacts of a THP be considered and analyzed, and that CAL FIRE "mitigate or avoid the significant effects on the environment of projects that it carries out or approves whenever it is feasible to do so." Pub. Res. Code § 21002.1(b); *see also* Pub. Res. Code § 21002 ("[It is the] policy of the state that public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures which will avoid or substantially lessen the significant environmental effects of such projects."). Mitigation of a project's significant impacts is one of the "most important" functions of CEQA. *Sierra Club v. Gilroy City Council*, 222 Cal.App.3d 30, 41 (1990).

As the lead agency, it is CAL FIRE's duty to ensure that any THP conforms with applicable law. The currently drafted THP fails to do so.

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Slope

A15-02

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II. SLOPE FACTOR						
Slope	5-15%	16-30%	31-40%	41-50%	51-70%	71-80% +
Rating	1-3	4-6	7-10	11-15	16-25	26-35

Even though the worksheet itself documents map units B, C, and D as having slopes ranging from 30-75%, the slope factor rating 4 - the low end of 16-30% - is used. This is plainly in error and the resulting moderate erosion hazard rating is likewise wrong.

"Slopes within the project boundary range from 8-27% with approximately one acre slightly greater than 30%. All watercourses are protected by a WLPZ and have slopes leading to them under 30%." (THP at p. 38) The THP's demonstrates the opposite.

Forest Practice Definitions, Section 936.5, Water and Lake Protection Zone widths.

WATERCOURSE	< 30% Slope	30 – 60% Slope	>60% Slope	Onsite?
Class I WLPZ	150'	150'	150'	None present
Class II-L WLPZ	100'	100'	100'	Non present
Class II-S WLPZ	50'	75'	100'	Present
Class III WLPZ	30'	55+	105+	Present

A15-02 (Cont.)

Napa County Ordinance

Slope	Width	Onsite?
1-5%	45'	None Present
5-15%	55'	Present
15-30%	65'	Present
30-40%	85'	Present
40-50%	105'	Present
50-60%	125'	Present
60-70%	150'	None Present

(THP at p. 50.)

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Special Status Species

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The THP fails as a CEQA equivalent document because it has made no meaningful analysis regarding sensitive species and the conclusions regarding impacts to wildlife are not supported by substantial evidence, or any evidence at all. CalFIRE has by no means met its burden of even describing the existing conditions of the site, much less provide conclusions regarding speciesl status species based upon substantial evidence.

Appendix D, the Biological Resources Report relied upon in the TCP, is a best, so substandard as to be useless, and at worst, a resulted oriented hack job that provides no meaningful analysis of the actual conditions of the site and resulting impacts of the projects.

The treatment of the western pond turtle is a glaring example of the complete inadequacy of the analysis of special status species. In the THP, CalFIRE appears to pretend as if the western pond turtle is not a candidate for listing under the ESA and that its behavior is radically different than that described in the scientific literature. In fact, on April 10, 2015, based upon a petition by the Center, the USFWS issued a positive 90 day finding that the western pond turtle "the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted for the western pond turtle *(Actinemys marmorata).* " The western pond turtle is a candidate for listing as well as being a Californai species of special concern, as such, the impact on this sensitive species needs to be addressed.

While CalFIRE admits in the TCP that "Western Pond Turtle (Emys marmorata) was observed in the reservoir on the property," it relies upon the completely unwarranted and scientifically wrong conclusions that a "buffer zone of 150 ft." means that "there is no need for protective measures due to the available upland estivation habitat surrounding the reservoir. It is unlikely that turtles would move into or use the proposed vineyard block habitat. (TCP at p. 64.) A15-03 (Cont.)

It is not just likely, but a given that the turtles onsite will move into the proposed vineyard area. Attachment B, incorporated here by reference, provides actual scientific, peer review studies that demonstrate that terrestrial habitat is critical for the survival of this species – they forage, rest, breed, and deposit eggs on terrestrial habitat up to as far as 400 m (1312 ft.) from aquatic habitat. A 150 buffer from the pond is totally inadequate to protect this species from the variety of impacts the timber harvest, and construction and operation of the vineyard will have.

Perhaps the consultant has confused meters and feet. Appendix D states "Clearing of vegetation will not occur within 100-feet of the reservoir. Nesting can occurs up to 100 meters away from aquatic habitat. Given the habitat surrounding the reservoir and 100-foot buffer we do not expect any impact to Western Pond Turtles in the area." (Appendix D at p. D-34.) 100 meters is 328 ft. Even if the 100 meter figure was accurate, which it is not, there is no evidence, much less substantial evidence, that a 100 or 150 wide buffer will protect pond turtles in any fashion and this conclusion is contradictory even to the information provided in Appendix D.

The conclusions in Appendix D regarding habitat suitability and on-site observations are likewise not credible. First, it is stated that no western pond turtles were observed on site (D-27)

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although such a sighting is described elsewhere. Secondly, it makes claims, with no supporting references, about species natural histories that are blatantly untrue. For example, Appendix D states that there is a lack of habitat for CRLF claiming that CRLF habitat is "creek, rivers, permanent flowing water." (D-26.) In fact, a year- round pond and multiple ephemeral streams is ideal CRLF habitat. Finally, the conclusions is makes regarding species presence are supported only by "studies" that would not suffice as scientific under any measure. A15-03 (Cont.)

Protocol level surveys need to be conducted. Appendix D does admit that there is a potential for habitat on project site for CRLF yet took no actions sufficient to determine if CRLF were present. Like the western pond turtle, CRLF travel far from aquatic habitat. They are also extremely sensitive to pesticides, sedimentation, and other disturbances created by this project.

There were no protocol level studies conducted for the CRLF or any other species. The "surveys" were conducted only during 5 months of the year, leaving out more than 50% of the year. There appears to have been NO survey protocols used. Appendix D states "Animals were identified in the field by their sign, sign, or call. Our field techniques consisted of surveying the area with binoculars and walking the perimeter of the site. . . Wildlife surveys involved walking and remaining stationary looking for movement and or sign of wildlife." (Appendix D at D-10.) This is totally insufficient for any species and demonstrably inadequate for a variety of special status species known to be found in the area such as the California Red Legged Frog.

Under the "look around" approach utilized here, CalFIRE has accepted the conclusion that there are no CRLF present. USFWS's *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog* recommends up to eight surveys, during the night and day, during breeding and non-breeding season, and over at least a six week period. Report should include photographs, maps, data sheets, surveyor qualifications, and detailed information on the project and project site; no such documentation is provided here. A15-04

Instead, "the edge of the reservoir was walked and surveyed with binoculars. (Appendiz D at D-11.) Based upon this, the conclusion that there are no CRLF found in this area within the range of the CRLF and with present suitable habitat is hard, if not impossible, to believe.

The THP similarly suffers in its failure to study and analyze Northern spotted owl, a variety of bat species, and many other special status species.

Thank you for the opportunity to submit comments on this proposed Project. We look forward to working to assure that the Project and environmental review conforms to the requirements of state law and to assure that all significant impacts to the environment are fully analyzed, mitigated or avoided. In light of many significant, unavoidable environmental impacts that will result from the Project, we strongly urge the Project not be approved. Please do not hesitate to contact the Center with any questions at the number listed below.

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Sincerely,

April Rose Sommer

A15-04
(Cont.)

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Center for Biological Diversity

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Scientific Name:

Actinemys marmorata (formerly *Clemmys marmorata*)

Common Name:

Western Pond Turtle or Pacific Pond Turtle

G Rank:

G3

IUCN Red List:

Vulnerable (assessed in 1996, now under review)

NATURAL HISTORY, BIOLOGY, AND STATUS

Range:

Distribution and abundance of the western pond turtle have declined as a result commercial exploitation for the pet trade, habitat loss and degradation, introduced species, and (locally) disease. The western pond turtle is discontinuously distributed and generally uncommon or rare from western Washington (Puget Sound region, at least formerly) south to northwestern Baja California (known only from the Pacific slopes of the San Pedro Martir) (Buskirk 1990, Bury and Germano 2008, NatureServe 2011). In Washington, the turtle has been essentially extirpated from historic habitat in the lower Puget Sound, and only two populations remain in the Columbia River Gorge (Allen et al. 2003). In May 2002, the Canadian Species at Risk Act listed the Pacific pond turtle (another common name for the western pond turtle) as being extirpated in Canada.

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Habitat:

The western pond turtle is found in permanent and intermittent waters of rivers, creeks, small lakes and ponds, marshes, irrigation ditches, and reservoirs (NatureServe 2011). It is sometimes found in brackish water. In a northern California stream, deep large pools with logs, branches, or boulders were favored sites (Bury 1972). The turtle commonly basks on land, near or away from water (Rathbun et al. 2002). The name "pond" turtle is something of a misnomer because this species more frequently lives in lotic habitats and spends a lot of time in terrestrial habitats (Ernst and Lovich 2009, p. 182).

To be sure, terrestrial habitat may be just as important as aquatic habitat for this turtle (Ernst and Lovich 2009). In some populations, males utilize terrestrial habitat for some portion of ten months annually, while females are on land during some of all months because of nesting and overwintering activities (Reese and Welsch 1997). In San Luis Obispo County, California, radio-tracked turtles spent 34-191 (mean 111) days in terrestrial refuges, generally under leaf litter in woodland and coastal sage scrub habitats, mainly from October to February (n = 43 turtle-years) (Rathbun et al. 2002). However, some did not leave aquatic habitat, and this flexibility occurs throughout the range of the species (Rathbun et al. 2002).

The western pond turtle usually nests on sandy banks near water or in fields or sunny spots up to a few hundred meters from water (Storer 1930, Nussbaum et al. 1983). In San Luis Obispo County, California, females nested in open areas with little vegetative cover that were 6-80 m (mean 28.2 m) (possibly up to 170 m) from water, 0.5-17.5 m in elevation above creek beds (Rathbun et al. 2002).

Biology and Taxonomy:

Mating, which has been rarely observed, typically occurs in late April or early May, but may occur year-round (Holland 1985a, 1991b). Females emigrate from the aquatic site to an upland location that may be a considerable distance (400 m or more) from the aquatic site to nest, but is often less, and deposit from 1-13 eggs that have a thin, but hard (calcified) outer shell in a shallow (ca. 10-12 cm deep) nests excavated by the females (Holland 1991a; Rathbun et al. 1992, 1993). Females may lay more than one clutch a year (Rathbun et al. 1993). Most oviposition occurs during May and June, although some individuals may deposit eggs as early as late April and as late as early August (Storer 1930; Buskirk 1992; Rathbun et al. 1992, 1993; D. Holland, pers. comm. as cited in Jennings and Hayes 1994).

Age and size at reproductive maturity varies with latitude (Jennings and Hayes 1994). In California, reproductive maturity occurs at between 7 and 11 years of age, and approximately 110-120 mm CL, with turtles maturing at a larger size and a more advanced age as one moves north, and males generally maturing at a slightly smaller sizes and younger ages than females (D. Holland, pers. comm. as cited in Jennings and Hayes 1994). Data on longevity are lacking, but western pond turtles are thought to be long-lived since the minimum age of a recaptured individual was 42 years from a population studied in northern California (Trinity County: B. Bury and D. Holland, pers. comm. as cited in Jennings and Hayes 1994).

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Western pond turtles are dietary generalists and highly opportunistic (Holland 1991a), and will consume almost anything that they are able to catch and overpower. The most prominent part of western pond turtle behavior is the activities they perform to thermoregulate, which vary with ambient temperature based on time of day and season (Jenning and Hayes 1994). Ernst and Lovich (2009, p. 173-182) and Bury and Germano (2008) summarize additional information on reproduction and other aspects of western pond turtle biology.

NatureServe (2011) explains that based on morphological data, Holman and Fritz (2001) split *Clemmys* as follows: *Clemmys guttata* was retained as the only member of the genus; *Clemmys insculpta* and *C. muhlenbergii* were placed in the genus *Glyptemys* (as first reviser, Holman and Fritz gave *Glyptemys* Agassiz, 1857, precedence over the simultaneously published genus *Calemys* Agassiz, 1857); and *Clemmys marmorata* was transferred to the monotypic genus *Actinemys*.

Population Status:

The western pond turtle qualifies for endangered species status because it is declining rangewide with many areas experiencing extirpations because of past collection pressure and ongoing habitat destruction. The western pond turtle is declining in abundance rangewide, especially in the northernmost part and southern one-third of the range (NatureServe 2011). Specifically, three areas show marked and significant declines in populations: southern California from Baja up to Ventura, the Central Valley of California, and the northernmost populations in Washington and perhaps Oregon (Bury and Germano 2008). Today, only northern California and southern Oregon support large populations but even in those areas their status is uncertain (Ernst and Lovich 2009, p. 181). The species was a candidate for federal protection until the FWS eliminated the C2 category, but it currently receives no federal protection under the ESA.

Moreover, areas where the turtles have experienced significant declines and extirpations must be considered significant portions of the range because of the unique genetic variation in those areas that is essential to longterm viability of the species. Spinks and Shaffer (2005) identified four major clades of the western pond turtle. These included a large Northern clade composed of populations from Washington south to San Luis Obispo County, California, west of the Coast Ranges; a San Joaquin Valley clade from the southern Great Central Valley; a geographically restricted Santa Barbara clade from a limited region in Santa Barbara and Ventura counties; and a Southern clade that occurs south of the Tehachapi Mountains and west of the Transverse Range south to Baja California, Mexico.

In Oregon, the western pond turtle occurs widely but in low to very low densities (Holland 1993). Researchers observed the turtles in 83 of 313 sites surveyed in 1991 (Holland 1993). In the Willamette Valley in Oregon, western pond turtles appear to have declined to a level that represents roughly one percent of historic levels (Holland 1991a).

In Washington, the total population in the early 1990s was fewer than 100 individuals in the wild (Andelman and Gray 1992). The species survives in the state only in two populations in the Columbia River Gorge (Allen et al. 2003).

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In California, there are probably a couple hundred extant occurrences statewide (Jennings and Hayes 1994). Many populations in California are small and declining with low viability (Jennings and Hayes 1994). In California's Central Valley, Germano and Bury (2001) surveyed 55 sites and they detected turtles at only 15 sites, and only 5 sites had sizable populations. Much of the natural habitat for the species in the Central Valley has been eliminated (Bury and Germano 2008). Brattstrom and Messer (1988) found that few viable populations remain in southern California and that only 6-8 viable populations remain south of the Santa Clara River system (including the desert slope) in California (Holland 1991a). As Jennings and Hayes explains: "[M]ost western pond turtle populations examined in this region appear to show an age (size) structure increasingly biased toward adults, indicating little or no recruitment is taking place." The decline in southern California has been rapid (Brattstrom 1988). In Baja California, most historic populations have been extirpated and only a few populations remain at remote localities (Holland 1991a).

The situation has undoubtedly declined since these studies published their findings. Moreover, the western pond turtle populations in some areas of northern California (e.g., the drainages entering Clear Lake, and portions of the Klamath River system in California) "are in equally serious or worse condition than those in southern California" (Jennings and Hayes 1994).

THREATS

Habitat alteration and destruction:

Decline of the western pond turtle is largely due to alteration, loss, and fragmentation of habitat (Bury and Germano 2008). Many populations have been lost as a result of urbanization and agricultural development in the area south of central California (Rathbun et al. 1992). And extensive draining of wetlands and habitat alteration in the last 100 years have left few aquatic areas in the Central Valley of California, where the species has seriously declined (Germano and Bury 2001, Bury and Germano 2008).

Massive water development projects have changed the location, flow, and use of water across most of the range of the species, particularly in the Central Valley of California (Bury and Germano 2008). Construction of dams on many rivers results in cooler water temperatures and faster flowing water, which is likely detrimental to turtle populations (Reese and Welsh 1998a,b). Also, the reservoirs behind these dams are likely unsuitable habitat because recreational activities such as fishing and skiing likely disturb the turtles (Bury and Germano 2008). In addition, some of these reservoirs have large draw downs seasonally, which inhibits growth of aquatic vegetation and associated invertebrate populations that are prey for turtles (Bury and Germano 2008). In northern California, damming of the mainstem Trinity River has likely negatively impacted juveniles (Reese and Welsh 1998). Specifically, the artificially colder thermal regime created by the hypolimnetic releases from the dam appears to be influencing the turtles' thermoregulatory behavior and forcing these animals to compensate by seeking alternative aquatic thermal refugia (Bettaso et al. 2006).

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In addition, Jennings and Hayes (1994) explains that abusive grazing practices have eliminated many populations (see also Holland 1991a). And according to Holland (1994), road mortality probably matches or exceeds all other anthropogenic effects.

Overutilization:

Many populations declined as a result of historical commercial exploitation (Bury and Germano 2008, NatureServe 2011). As a relatively large turtle, the species was once widely utilized for food (Bury and Germano 2008, Ernst and Lovich 2009). Populations around San Francisco and in the Sacramento-San Joaquin River Delta were persecuted mercilessly for the food market (Bettelheim 2005).

The pet trade has also seriously reduced some populations. Bury (1989) reported that one pet wholesaler obtained about 500 individuals from a southern California lake. Betteleheim (2005) reports that large numbers were removed from southern California rivers and streams in the 1970s and 1980s.

In addition, some turtles are deliberately shot while basking and others are inadvertently caught while fishing (Bury and Germano 2008). Surveys in Oregon also indicate that western pond turtles are frequently caught on baited hooks and are subsequently released carrying a hook that can significantly impair or entirely prevent normal feeding (Mader 1988). Based on the weight loss observed in such turtles, a high likelihood exists that most of the individuals caught in this manner ultimately perish if released without removal of the hook.

Disease or predation:

In Washington, decline was exacerbated by an upper respiratory disease epidemic in 1990, leaving a total population of fewer than 100 individuals in the wild (Andelman and Gray 1992). Observations also suggest the potential occurrence of a similar disease syndrome in one northern California population (Jennings and Hayes 1994). As such, disease should be considered a threat to the western pond turtle.

The native raccoon can be a problem in situations where turtle habitat occurs in urban environments because of artificially high raccoon populations associated with supplemental food from human habitations (Bury and Germano 2008).

Inadequacy of existing regulatory mechanisms:

The western pond turtle has special status under state law within its entire native range (Bury and Germano 2008). It is listed as state endangered in Washington, sensitive/critical in Oregon, and a species of special concern in California. But none of these laws confer effective protection of habitat. Some successful recovery actions have occurred in Washington and a conservation strategy drafted for California, but these initiatives are merely voluntary and must be considered inadequate (Allen et al. 2001, Ashton and Welsh Jr. 2009, vander Haegen et al. 2009). Federal protection would lead to more resources being devoted to these and other recovery actions.

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Some habitat for the turtle is protected in waters designated as Wild and Scenic Rivers but this protection applies to few rivers within the turtle's range. In addition, the turtle occurs in some state and federal parks but habitat management practices that harm the turtles are not prohibited. Moreover, only a small fraction of the turtle's habitat is found in these areas.

In 1991, a Western Pond Turtle Group was established to foster communication and coordinate research and develop a strategic plan for its conservation (Bury and Germano 2008). Despite these efforts, the western pond turtle continues to decline.

Other factors:

Nonnative turtles, including *Trachemys scripta*, likely have negatively affected western pond turtles through competition for basking sites and introduction of disease (Spinks et al. 2003, Patterson 2006).

In addition, introductions of non-native predators (bullfrogs and bass) have likely been detrimental (NatureServe 2011). Bullfrogs prey on hatchling or juvenile turtles (Moyle 1973, Holland 1991a). Bass (*Micropterus* spp.) are also known to prey on the smallest juveniles (Holland 1991a).

Chemical contaminants also threaten the western pond turtle. Spills of diesel fuel and other chemicals have harmed turtles in California and Oregon locations in the last few decades (Holland 1994, Luke and Sterner 2000, Lovich and Meyer 2002), sometimes with disastrous effects (Ernst and Lovich 2009, p. 181). Eggs of this turtle tested in Oregon contained low concentrations of organochlorine pesticides and PCBs, along with heavy metals mercury and chromium (Henny et al. 2003).

Finally, remaining isolated clusters of the turtles are separated by inhospitable areas of cities and roads (Bury and Germano 2008). As such, isolation should be considered a threat to the turtle.

References:

Allen, H.L., F. Slavens, K. Slavens, D. Anderson, K. McAllister, J. Lewis, and D. Shepherdson. 2001. Recovery program for the endangered western pond turtle in Washington state. Northwestern Naturalist 82(2): 65.

Andelman, S. J., and E. Gray. 1992. Viability and recovery of western pond turtle (*Clemmys marmorata*) populations in Washington state. Abstract, Society for Conservation Biology, 6th Annual Meeting, p. 33.

Ashton, Don T., and H.H. Welsh Jr. 2009. A Conservation Strategy for Western Pond Turtles in California. Turtle Newsletter 14: 21-23.

Bettaso, J.B., D.T. Ashton, H.H. Welsch, and R.M. Sullivan. 2006. Basking patterns and thermal regulatory behaviors of western pond turtles (*Clemmys marmorata*): comparing

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responses to thermal regimes in dammed and undammed tributaries of the Trinity River. Northwestern Naturalist 87(2): 155.

Bettelheim, M. 2005. Marmorata: The famed mud turtle of the San Francisco market. California Hist. 82: 26-42, 65-68.

Brattstrom, B.H. 1988. Habitat destruction in California with special reference to *Clemmys marmorata*: a perspective. In H.F. DeLisle, et al. (eds.), Proceedings of the Conference on California Herpetology. Southwest. Herpetol. Soc., Van Nuys, California.

Brattstrom and Messer. 1988. Current status of the southwestern pond turtle, *Clemmys marmorata pallida*, in southern California. Final report for California Dept. Fish and Game, Contract C-2044. 47 pp.

Bury, R. B. 1972. Habits and home range of the Pacific pond turtle, *Clemmys marmorata*, in a stream community. Ph.D. dissertation, Univ. California, Berkeley.

Bury, R.B, and D.J. Germano. 2008. *Actinemys marmorata* (Baird and Girard 1852) – Western pond turtle, Pacific pond turtle. Conservation Biology of Freshwater Turtles and Tortoises: A compilation project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs No. 5.

Buskirk, J. R. 1990. Geographic distribution: *Clemmys marmorata*. SSAR Herpetol. Rev. 21(1):26.

Buskirk, J. R. 1991. An overview of the western pond turtle, *Clemmys marmorata*. Pages 16-23 in Beaman, K. R., F. Caporaso, S. McKeown, and M. D. Graff, editors. Proceedings of the First International Symposium on Turtles and Tortoises: Conservation and Captive Husbandry. Chapman University, Orange, California.

Buskirk, J. R. 1992. An overview of the western pond turtle, *Clemmys marmorata*. pp. 16-23 In: K. R. Beaman, F. Caporaso, S. McKeown, and M. Graff (editors), Proceedings of the first international symposium on turtles and tortoises: Conservation and captive husbandry. California Turtle and Tortoise Club, Van Nuys, California.

Ernst, C.H. and J.E. Lovich. 2009. Turtles of the United States and Canada. The John Hopkins University Press. 827 pages.

Germano, D.J. and R.B. Bury. 2001. Western pond turtles (*Clemmys marmorata*) in the Central Valley of California: Status and population structure. Trans. West. Sect. Wildl. Soc. 37: 22-36.

Henny, C.J., K.F. Beal, R.B. Bury, and R. Goggans. 2003. Organochlorine pesticides, PCBs, trace elements and metals in western pond turtle eggs from Oregon. Northwest Sci. 77: 46-53.

Holland, D. C. 1985a. An ecological and quantitative study of the western pond turtle (*Clemmys marmorata*) in San Luis Obispo County, California. MA Thesis, Fresno State

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University, Fresno, California.

Holland, D. C. 1991a. A synopsis of the ecology and status of the western pond turtle (*Clemmys marmorata*) in 1991. Report prepared for the United States Fish and Wildlife Service, National Ecology Research Center, San Simeon Field. Station, San Simeon, California.

Holland, D. C. 1991b. Status and reproductive dynamics of a population of western pond turtles (*Clemmys marmorata*) in Klickitat County, Washington in 1991. Report prepared for the Washington Department of Wildlife, Olympia, Washington.

Holland, D. C. 1993. A synopsis of the distribution and current status of the western pond turtle (*Clemmys marmorata*) in Oregon. Unpublished report, Nongame Division, Oregon Department of Fish and Wildlife.

Holland, D.C. 1994. The western pond turtle: habitat and history. Final Rep. U.S. Dept. of Energy, Bonneville Power Adm. Proj. 92-068, Contr. DE-BI79-92B62137.

Jennings, M.R., and M.P. Hayes. 1994. Amphibian and reptile species of special concern in California. California Dept. of Fish Game, Rancho Cordova.

Lovich, J.E. and K. Meyer. 2002. The western pond turtle (*Clemmys marmorata*) in the Mojave River, California, USA: Highly adapted survivor or tenous relict? J. Zool. (London) 256: 537-45.

Luke, C. and D. Sterner. 2000. Possible impacts of the Cantara spill on reptile populations along the upper Sacramento River. California Fish Game 86: 61-71.

Mader, D. R. 1988. Herpetological medicine: Off-feed animals. The Vivarium 1(1): 31-34.

Moyle, P. B. 1973. Effects of introduced bullfrogs, *Rana catesbeiana*, on the native frogs of the San Joaquin Valley, California. Copeia 1973(1): 18-22.

NatureServe. 2011. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia, *available at* http://www.natureserve.org/explorer.

Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University Press of Idaho, Moscow, Idaho. 332 pp.

Patterson, L.C. 2006. Life history and ecology of an introduced population of red-eared sliders (*Trachemys scripta elegans*) in the Central Valley of California with implications for the conservation of the western pond turtle (*Emys marmorata*). M.S. Thesis, California State University, Sacromento.

Rathbun, G. B., M. R. Jennings, T. G. Murphey, and N. R. Siepel. 1993. Status and ecology of sensitive aquatic vertebrates in lower San Simeon and Pica Creeks, San Luis Obispo County, California. Unpublished Report, National Ecology Research Center, Piedras Blancas Research Station, San Simeon, California, under Cooperative Agreement (14-16-0009-91-1909).

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Rathbun, G. B., N. Siepel, and D. C. Holland. 1992. Nesting behavior and movements of western pond turtles (Clemmys marmorata). The Southwestern Naturalist 37(3): 319-324.

Rathbun, G. B., N. J. Scott, Jr., and T. G. Murphey. 2002. Terrestrial habitat use by Pacific pond turtles in a Mediterranean climate. Southwestern Naturalist 47: 225-235.

Reese, D. A., and H. H. Welsh, Jr. 1997. Use of terrestrial habitat by western pond turtles, *Clemmys marmorata*: implications for management. Pages 352-357 in J. V. Abbema, editor. Proceedings: conservation, restoration, and management of tortoises and turtles--an international conference. New York Turtle and Tortoise Society and Wildlife Conservation Society, New York.

Reese, D. A., and H. H. Welsh, Jr. 1998a. Comparative demography of *Clemmys marmorata* populations in the Trinity River of California in the context of dam-induced alterations. Journal of Herpetology 32: 505-515.

Reese, D. A., and H. H. Welsh, Jr. 1998b. Habitat use by western pond turtles in the Trinity River, California. Journal of Wildlife Management 62: 842-853.

Spinks, P.Q. and B.H Shaffer. 2005. Range-wide molecular analysis of the western pond turtle (*Emys marmorata*): cryptic variation, isolation by distance, and their conservation implications. Molecular Ecology 14(7): 2047.

Spinks, P.Q, G.B. Pauly, J.J. Crayon, and H.B. Shaffer. 2003. Survival of the western pond turtle (*Emys marmorata*) in an urban California environment. Biol. Conserv. 113: 257-67.

Storer, T. I. 1930. Notes on the range and life-history of the Pacific fresh-water turtle, *Clemmys marmorata*. Univ. Calif. Publ. Zool. 32(5): 429-441.

vander Haegen, W.M., S.L. Clark,K.M. Perillo, D.P. Anderson, and H.L. Allen. 2009. Survival and Causes of Mortality of Head-Started Western Pond Turtles on Pierce National Wildlife Refuge, Washington. Journal of Wildlife Management 73(8): 1402-7.

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Comment Letter P1

UNIT. F~~G~~, ~~WQ~~, ER, LM, RPF, ftp/new

Dick Crain
850 Friesen Dr
Angwin Ca 94508
707 965 1518
dick@fcs.net

To: Forest Practice Project Manager
Cal Fire
135 Ridgeway Ave
Santa Rosa Ca 95401

1-15-081 NAP

Regarding: Protection of Howell Mountain Mutual Water Company Watershed

Gentlemen: The Following Project is outside the water shed of HMMWCo, but is serviced by an access road Thru the HMMWCo Watershed

THP Davies Estates Friesen Vineyards
Portion of NW quarter of Section 25
T9N, R6WMD B&M. The town of Angwin in Napa County Ca. lies approx 3 miles east of the proposed projet.

The access road to this property has encountered erosion control problems and has a water crossing bridge with high failure probibility. If your department is concerned with the impact this project has for the water quality of Howell Mountain Mutual Water, please contact Dick Crain, a seven year board member of the HMMWCo and 49 years of water co association.

Sincerely
Dick Crain

P1-01

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Comment Letter P2

Attached please find my comments regarding the Draft EIR for the Davis Friesen Draft EIR. Should you need to contact me by telephone, it is best to use my mobile number: 707-486-2038.
Thank you.
David Graves

P2-01

From: David Graves [mailto:wavey1500@icloud.com]
Sent: Friday, September 25, 2015 3:30 PM
To: David W. Graves
Subject: Davis Friesen Draft EIR

William Solinsky, Forester III
CalFire, Resource Management
P.O. Box 944246
Sacramento, California 94244-2460
SacramentoPublicComment@fire.ca.gov

Sept. 25, 2015

Dear Sir:

I am writing to point out the defects of the Davis Friesen Vineyard Draft EIR. Let me place my comments in the context of what a Draft Environmental Impact Report is meant to accomplish, in the words of the authors of this Draft Report. In the Introduction (Section 1.0 of the Draft Report) the authors state:

As required by CEQA *Guidelines* § 15121, this Draft EIR will: (a) inform public agency decision-makers, (b) identify possible ways to minimize any potential adverse environmental effects of the Proposed Project, and (c) describe reasonable and feasible project alternatives.

P2-01 (Cont.)

In fact, the Draft Report fails to inform public agency decision makers of status of one of the animal species found on the property, fails to describe the impossibility of mitigation should the Project proceed as proposed and fails to acknowledge that the Project cannot be modified in such a way as to fulfill its goals and at the same time prevent "take" of that species.

First, the Draft Report misstates the status of the Western Pond Turtle:

4.4.5 SPECIAL STATUS SPECIES

Special status species are those considered to be of management concern to state and/or federal resource agencies, including species:

- ·Listed as endangered, threatened or candidate for listing under the Federal Endangered Species Act.

P2-02

(The Western Pond Turtle is in fact under active consideration for listing as Endangered, as can seen below.)

Regarding the the site itself, the Draft Report goes on to state:

The project parcel for the Proposed Project does not contain Critical Habitat for federally listed species. (Draft Report 4.4.2-1)

Regarding the status of the Western Pond Turtle, on April 10, 2015, **before the publication of this Draft Report**, the Fish and Wildlife Service, Dept. of the Interior, published in the Federal Register its intention to study the status of the Western Pond Turtle for listing as an Endangered Species:

Evaluation of a Petition To List the Western Pond Turtle as an Endangered or Threatened Species Under the Act

Additional information regarding our review of this petition can be found as an appendix at http://www.regulations.gov under Docket No. FWS-R8-ES-2015-0024 under the Supporting Documents section.

Species and Range
Western pond turtle or Pacific pond turtle (Actinemys marmorata; formerly Clemmys marmorata); California and Washington

Petition History

On July 11, 2012, we were petitioned by the Center for Biological Diversity to list 53 amphibian and reptile species across the United. The western pond turtle was one of the species petitioned for listing.

Finding

Based on our review of the petition and sources cited in the petition, we find that the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted for the western pond turtle (Actinemys marmorata) based on Factor A.

Thus, for the western pond turtle, the Service requests information on the five listing factors under section 4(a)

P2-02
(Cont.)

(1) of the Act, including the factor identified in this finding (see Request for Information, above). (Federal Register vol. 80. No. 69, p. 19259)

P2-02 (Cont.)

The Draft Report does acknowledge the presence of Western Pond Turtles (4.4-39-40):

This species [Western Pond Turtle] was observed in the vicinity of the reservoir located in the eastern portion of the property. One adult western pond turtle was observed basking on the edge of the reservoir during biological surveys of the property. The reservoir and surrounding areas provide suitable habitat for the western pond turtle; however, ***suitable habitat is not present within the project footprint. Suitable habitat may occur in the Wild Lake Reservoir, approximately 230 feet west of the property; however, this is at least 230 feet away from proposed project activities and there is no hydrologic connectivity between the onsite reservoir and Wild Lake Reservoir. (emphasis added).***

The authors of the Draft Report go on to state in the Executive Summary of Environmental Impacts:

Impact 4.4-7: Development of the Proposed Project would not have the potential to affect the western pond turtle (WPT); therefore, this is a less-than- significant impact.

P2-03

Less than Significant

Mitigation Measure 4.4-7: No mitigation is required.

Not Applicable

As demonstrated by the literature I cite, this comment betrays a profound ignorance of the use of terrestrial habitat by Western Pond Turtles. At least three separate papers describing careful research in a variety of habitats in California have shown that turtles use terrestrial habitats hundreds of meters away from waterbodies:

For terrestrial habitat protection, we suggest that a minimum buffer zone around these seasonally inundated ponds of at least 250–350 m would be sufficient, with a special emphasis on preserving moderately dense, woody vegetation (e.g., understory canopy cover about 40% and overstory canopy cover around 24%). Human activities within this buffer may need to be restricted, especially from September (or when ponds begin to dry) until March, corresponding to the period of active migration and overwintering.

Pilliod, D.S. Welty, J.L. and and R. Stafford. (2013) Terrestrial Movement Patterns of Western Pond Turtles (Actinemys marmorata) in Central California. Herpetological Conservation and Biology, Vol. 8, No. 1: pp 207-221.

This is exactly the sort of habitat that occurs on this site that will be eliminated should this project proceed as planned. Reese and Walsh (1997) describe the turtles' use of terrestrial habitat in another landscape:

We observed frequent and prolonged use of terrestrial habitat for both nesting and overwintering activities; the turtles travelled into upland areas as far as 500 m from the river. Males utilized terrestrial habitat in at least ten months of the year, and females were on land every month as a result of their additional terrestrial behavior while gravid. Hatchlings overwintered in the nest. These observations suggest that the terrestrial habitat is as important as the aquatic habitat to the viability of western pond turtle populations. The implications for management are significant, considering the variety of development pressures on lands adjacent to waterways.

Reese, D.A., and H.H. Welsh, Jr. 1997. Use of terrestrial habitat by Western Pond Turtles, Clemmys marmorata: implications for management. Pp. 352– 357 In Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles – An Herpetological Conservation and Biology 219 International Conference. J. Van Abbema (Ed.). New York Turtle and Tortoise Society, New York, New York. Rowe, J.W. 2003.

P2-03 (Cont.)

Zaragoza et al. also describe terrestrial habitat use in yet another region:

The majority of terrestrial locations were concealed completely in litter or duff and 95% of terrestrial locations during the study occurred within 187 m of the pond edge.....Our results reinforce the importance of terrestrial habitat in the life history of Western Pond Turtles and the context-dependence of their habitat needs.
(George Zaragoza, Jonathan P. Rose, Kathryn Purcell, and Brian D. Todd (2015) Terrestrial Habitat use by Western Pond Turtles (Actinemys marmorata) in the Sierra Foothills. Journal of Herpetology: September 2015, Vol. 49, No. 3, pp. 437-441.)

And so it is clear that the analysis contained in the Draft Report is fatally flawed: indeed, there is **no** mention of the well-established fact that Western Pond Turtles use terrestrial habitat for a large portion of the year, for overwintering and for nesting. Ironically, the cover photograph of the Draft Report shows exactly the sort of terrestrial habitat that should be left undisturbed for use by the Western Pond Turtles.

To summarize, the Draft Report ignores the near-certainty that the Western Pond Turtle will be federally listed as Endangered at the end of the 12-month study period that began on April 10, 2015. It ignores the literature demonstrating the use of terrestrial habitats adjacent to water bodies by Western Pond Turtles. The extent of this use in similar habitats has been shown to extend for hundreds of meters away from the edge of aquatic habitats.

P2-04

Furthermore, also based on the literature cited, it is likely that there is connectivity between the population of turtles in the adjacent Dunn-Wildlake Preserve, the population in the pond on the Davis property and the ponds further downslope.

For these reasons, the Draft Report is woefully inadequate in its analysis of the impacts of the Project; the impacts of the Project cannot be mitigated. Therefore, this Project cannot be approved.

Sincerely yours,

P2-04
(Cont.)

David W. Graves
459 Randolph St.
Napa, CA 94559

B.S. University of California, Santa Cruz, Biology with Honors

cc: D. Zador
L. Markham

UNIT, ~~EG, WQ~~, ER, LW, RPF

From: dorie <doriepellegrin@gmail.com>
Sent: Sunday, September 27, 2015 7:45 PM
To: Kin.sone@fire.ca.gov; Santa Rosa Review Team@CALFIRE
Subject: Howell Mtn. Water Shed and Davis Family Estate Vineyard Project 1-15-081NAP
Attachments: Letter 9 27 15 Scott Butler.docx

9/27/15 Letter to Scott Butler. Please see the attached letter that you are being copied on. P3-01

I am sending this to you for Richard Crain. His information is on top of letter head.

--
Dorie A. Pellegrin
Project Manager/Purchasing
59 E. Highland Drive
Camarillo, CA 93010
Cell:805-377-0891
Fax: 805-482-4395

Richard Crain
850 Friesen Drive
Angwin, CA 94508
(707) 965-1514
dick@fcs.net

September 27, 2015

Environmental Resource Management
Scott R. Butler
889 Highway 20-26
Ontario, OR 97914

1-15-081 NAP

RE: Protection of Howell Mountain Mutual
Water Company Water Shed
&
Davis Family Estate, Friesen Vineyard Project

Scott:

The use of terms "very good condition" and "what has taken place in the past" are vague terms. Also, you must remember all civil engineering designs have a probability of failure.

P3-01 (Cont.)

The "concrete slab" you refer to has piers and beams. Water level of the lake adjusts on either side without overflowing "the concrete slab." Is it the place of the R.P.F. to make a civil engineering evaluation of the concrete slab? The existing concrete slab was constructed over the previous lake crossing after incurring damage by CDF tractors in the 1964 fire.

Where are the guard rails as required by Cal Fire in other civil engineering design?

P3-02

Sincerely,

Richard Crain

Richard P. Crain

cc: kin.sone@fire.ca.gov
Santarosareviewteam@fire.ca.gov

Comment Letter P4

----- Forwarded Message -----
From: Joanne Yates <shsirene77@comcast.net>
To: Scott.Butler@sbcglobal.net; Kim.Sone@fire.ca.gov
Sent: Monday, September 28, 2015 11:27 AM
Subject: Bell Canyon File #1-15-081 NAP

Thank you for your time.

My husband and I are long-time residents in Deer Park and live on Canon Park Drive. In 33 years, we have seen far too many "timber harvests" in our area and in Angwin for vineyards.

There are large swaths of vineyards surrounding Angwin and Bell Canyon now, prices for water have risen drastically in Angwin, and the hospital water supply is intermittently cloudy.

We respectfully ask that Cal Fire recommend for a moratorium on any further clear cutting for any purpose, especially near water sources like Bell Canyon Reservoir and watershed . P4-01

It not a matter of aesthetics, but the protection of wildlife corridors and habitat, as well as maintaining a dependable and safe source of water.

Again, we thank you for your consideration.

Donald and Joanne Yates
555 Canon Park Drive
St. Helena, CA 94574

707-963-0201

Comment Letter P5

----- Forwarded Message -----
From: Michael Heffner <sfhef@yahoo.com>
To: "Scott.Butler@sbcglobal.net" <Scott.Butler@sbcglobal.net>; "Kim.Sone@fire.ca.gov" <Kim.Sone@fire.ca.gov>
Cc: Michael Heffner <sfhef@yahoo.com>; "mhackett54@gmail.com" <mhackett54@gmail.com>; Lenard Heffner <lhheffner@gmail.com>; Brent Heffner <jibmasterbrent@yahoo.com>
Sent: Monday, September 28, 2015 10:48 AM
Subject: Please, Please, No Bell Canyon Watershed Clear Cutting

Hello Sirs and Madams,

We own property (357 Tobin Ave.) in Angwin and strongly oppose the proposed clear cutting on the Mountain watershed (project file number: 1-15-081 NAP). Too much cutting the past 30 years has already significantly altered wind patters where we are atop the hill off the North side of White Cottage. We are also concerned about displacing even more wildlife, as they end up on our porch... Also, Mom and Dad live in St. Helena and have depended on that delicate water for survival since the mid '60s. P5-01 P5-02 P5-03

Please let me know anything we can do to help preserve the drinking water, and fragile ecosystem on our beloved Howell Mountain. Thank you so much (!!) for your efforts to help us keep careless, inconsiderate newcomers from irreparably altering and destroying our beautiful land and fragile water shed zones.

Very Best,

Michael Heffner
707.637.7740 P5-04

Dreams are the touchstones of our character. ~~Henry David Thoreau

Comment Letter P6

----- Forwarded Message -----
From: Michelle MacKenzie <michellehmackenzie@gmail.com>
To: Kim.Sone@fire.ca.gov; Scott.Butler@sbcglobal.net
Sent: Monday, September 28, 2015 2:52 PM
Subject: 1-15-081 NAP

I write to object to the proposed timber "harvest" on Howell Mountain in Angwin, California. Cutting down the forest in this area will negatively impact the Bell Canyon watershed, which is the source of water that flows to my parents' home town of St. Helena. Because the land in question borders the Land Trust Dunn-Wildlake Preserve, it will damage critical wildlife habitat, including a small lake shared with the preserve. While drought ravages our beautiful state, making life harder for our wildlife, we should not be allowing projects, like this one, that reduce, fragment and impair habitat. P6-01

I have hiked in these woods many times with my parents. They are incredibly diverse both in terms of tree species and bird species. Moreover, I am always shocked by the absolute magical abundance of birds that we see there. We need to protect these places for our next generation and to ensure wildlife survival in the midst of a changing climate. P6-02

Please reject the proposed timber harvest on Howell Mountain.

Sincerely

Michelle MacKenzie
San Carlos, California
(my parents live in St Helena, Ca)

Comment Letter P7

----- Forwarded Message -----
From: Robin Lail <robin@lailvineyards.com>
To: Scott Butler@sbcglobal.net; Kim Sone@fire.ca.gov
Sent: Monday, September 28, 2015 12:00 PM
Subject: 1-15-081NAP

Gentlemen:

Regarding the proposed "timber harvest" for a new Davis vineyard, I am writing to request an extension of the time for public comment from the current October 5th cutoff. P7-01

The area slated for this "harvest" is in the Bell Canyon watershed bordering on the Dunn-Wildlake Preserve. This affects not only residents neighboring the watershed, but the residents of the town of St. Helena which gets substantial water from Bell Canyon. Watersheds are sensitive systems absorbing water through vegetation and soils and releasing it by way of its creeks and stream beds in a regular and predictable manner. Any disturbance in the drainage can affect flow and purity.

With this in mind, it is extremely important to review the request for this clear cut on the basis of as much information as possible including environmental concerns, alternatives and potential consequences before moving ahead.

Thank you for your valued consideration of my request, P7-02

Robin Lail
320 Stone Ridge Road
Angwin

Robin Daniel Lail, Founder

Lail Vineyards

A Family Tradition Since 1879

Comment Letter P8

From: Kara Dunn <karapdunn@sbcglobal.net>
To: Scott.Butler@sbcglobal.net; Kim.Sone@fire.ca.gov
Cc: mhackett54@gmail.com
Sent: Wednesday, September 30, 2015 11:00 AM
Subject: Timber Harvest 1-15-081 NAP

Dear Scott & Kim: As an Angwin resident and a concerned open space preservation supporter, I'm opposed to the timber harvest proposed for file # 1-15-081 NAP. The proposed clear cut is exactly where it shouldn't be. It borders on the Land Trust Dunn-Wildlake Preserve, one of the most diversified wildlife areas in California, and shares a small lake with the Preserve. Once the clear cut is turned into vineyard, wildlife that live and move through the area will be increasingly restricted. Thank you for taking my concerns into consideration. ~Kara Dunn

P8-01

Kara Dunn
Retro Cellars
kara@retrocellars.com
707.965.1042

RETRO
CELLARS

UNIT, FG, WQ, ER, LM, RPF

From: Gary Dowling <garyb24s@gmail.com>
Sent: Wednesday, September 30, 2015 11:32 AM
To: Santa Rosa Public Comment@CALFIRE
Subject: Timber harvest 1-15-081 NAP

Dear Sir,

This project is exactly in the wrong place, Next to Dunn Wildlake reserve, and above Bell Canyon reservoir. The terrain really has no merit except for the ability to say you have Howell Mountain grapes. P9-01
I'm hoping that people with financial clout don't get to twist things in this case, as this is a project that shouldn't happen.

Regards,

Gary Dowling

RECEIVED
SEP 30 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

From: Sone, Kim@CALFIRE
Sent: Wednesday, September 30, 2015 11:11 AM
To: Gary Dowling
Cc: Santa Rosa Public Comment@CALFIRE
Subject: RE: Timber Harvest 1-15-081 NAP

Hi Gary
You have sent your public comment letter to an incorrect email address. Please send public comment letters to santarosapubliccomment@fire.ca.gov
I have forwarded your comment letter to the correct address as a curtesy.

Kimberley Sone
Unit Forester
CAL FIRE
Sonoma-Lake-Napa Unit
2210 West College Ave
Santa Rosa, CA 95403
(707) 576-2344 office
(707) 889-4217 cell

RECEIVED
SEP 30 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

From: Gary Dowling [mailto:garyb24s@gmail.com]
Sent: Wednesday, September 30, 2015 9:26 AM
To: Sone, Kim@CALFIRE
Subject: Timber Harvest 1-15-081 NAP

P9-01 (Cont.)

Hello,

I am writing to offer my disapproval of the unneeded Timber Harvest 1-15-081 NAP.
This project is in exactly the wrong place, next to Dunn Wildlake preserve, and above Bell Canyon Reservoir.
The owner has been offered other alternatives for his property,
but is bound and determined to get his own, Howell Mountain grapes, no matter what the cost to the environment.
Please reject this unneeded clear cutting.

Regards,

Gary Dowling

From: Sone, Kim@CALFIRE
Sent: Wednesday, September 30, 2015 11:12 AM
To: Santa Rosa Public Comment@CALFIRE
Subject: FW: Timber Harvest 1-15-081 NAP

Kimberley Sone
Unit Forester
CAL FIRE
Sonoma-Lake-Napa Unit
2210 West College Ave
Santa Rosa, CA 95403
(707) 576-2344 office
(707) 889-4217 cell

RECEIVED
SEP 30 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

From: Gary Dowling [mailto:garyb24s@gmail.com]
Sent: Wednesday, September 30, 2015 9:26 AM
To: Sone, Kim@CALFIRE
Subject: Timber Harvest 1-15-081 NAP

P9-01
(Cont.)

Hello,

I am writing to offer my disapproval of the unneeded Timber Harvest 1-15-081 NAP.
This project is in exactly the wrong place, next to Dunn Wildlake preserve, and above Bell Canyon Reservoir.
The owner has been offered other alternatives for his property,
but is bound and determined to get his own, Howell Mountain grapes, no matter what the cost to the environment.
Please reject this unneeded clear cutting.

Regards,

Gary Dowling

From: Gary Dowling <garyb24s@gmail.com>
Sent: Wednesday, September 30, 2015 11:30 AM
To: Santa Rosa Public Comment@CALFIRE
Subject: Fwd: Timber Harvest above Bell Canyon 1-15-081 NAP

---------- Forwarded message ----------
From: **Gary Dowling** <garyb24s@gmail.com>
Date: Wed, Sep 30, 2015 at 8:45 AM
Subject: Timber Harvest above Bell Canyon 1-15-081 NAP
To: Scott.Butler@sbcglobal.net

RECEIVED
SEP 30 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

Dear Sir,

This project is exactly in the wrong place, Next to Dunn Wildlake reserve, and above Bell Canyon reservoir. The terrain really has no merit except for the ability to say you have Howell Mountain grapes.
I'm hoping that people with financial clout don't get to twist things in this case, as this is a project that shouldn't happen. P9-01 (Cont.)

Regards,

Gary Dowling

Comment Letter P10

From: Tracey Hawkins <tracey@hawkandhorsevineyards.com>
To: "Scott.Butler@sbcglobal.net" <Scott.Butler@sbcglobal.net>; "Kim.Sone@fire.ca.gov" <Kim.Sone@fire.ca.gov>
Sent: Wednesday, September 30, 2015 10:48 PM
Subject: file number: 1-15-081 NAP

Dear Mr. Butler and Ms. Sone,

I am writing to voice my concern for the above mentioned action (file number: 1-15-081 NAP)
which is, to my understanding, a request to clear cut for the stated purposes of timber harvest. I would like to suggest, at a minimum, an extension of the discussion period be considered to ensure the environmental concerns, alternatives and potential consequences have been thoroughly addressed before the permit is considered. It is my opinion that this action should be denied. P10-01

I have a home on Howell Mountain and I also run a family ranch in Lower Lake. Having just been through the devastation of both the Valley Fire as well as the recent Rocky and Jerusalem fires I am extremely concerned by what we have already lost in terms of deforestation due to all of the recent fires on the Mayacama Mountain Range.

We are all very thankful to CalFire for working so hard all summer on the many fires that impacted our communities. I feel certain that you will share my deep concern about any non-necessary removal of trees on the Mayacama Mountain range at this time. Please forgive my bluntness, but the need for timber harvesting at this time seems like a ruse – or a cruel joke. A drive through Lake County right now would reveal thousands of acres of timbers lying all over the ground. These are being cut down because of fire damage. They are burned on the outside but could still be milled and used for timber. It defies reason why one would be considering timber harvesting on several acres in nearby Angwin at this time – on the very same Mayacama Mountain range. P10-02

In addition, it is my understanding that this activity will happen more specifically in the Bell Canyon watershed, the source of water that flows to St. Helena where the community depends upon the ongoing supply of water.

This is a sensitive system absorbing water through its vegetation and soils and releasing it by way of its creek and stream beds in a regular and predictable manner. Any disturbance in the drainage can affect flow and purity. P10-03

The proposed clear-cut is also on land that borders the Land Trust Dunn-Wildlake Preserve, one of the most diversified wildlife areas in California. In fact, it shares a small lake with the Preserve. Once the area is Clear Cut it seems likely that it will be turned into vineyard. Wildlife that live and move through the area will be increasingly restricted. P10-04

For all of these reasons I am against this project and, again, request that this request be flatly denied.

Most respectfully yours,
Tracey Hawkins
1180 Summit Lake Drive
Angwin, CA
707/481-6941

P10-04
(Cont.)

Comment Letter P11

Subject:	THP 1-15-081 NAP
From:	Lisa & Larry Carr (carrhollow@gmail.com)
To:	Scott.Butler@sbcglobal.net; Kim.Sone@fire.ca.gov; SantaRosaPublicComment@fire.ca.gov;
Date:	Saturday, October 3, 2015 9:51 PM

Dear Ms. Sone & Mr. Butler,

I am writing with the utmost concern and opposition to the Bell Canyon Timber Harvest Plan on Howell Mountain in the Angwin area. This project should not be allowed for development in any form as it will be extremely detrimental to the City of St. Helena. Please grant an extension of the discussion period to ensure that all environmental concerns have been addressed. P11-01

More and more vineyard development is moving into the hills which are the source of most of the Napa County watersheds. Trees are a vital component of the watershed ecosystem and absorb water through its vegetation and root systems. We see in news and documentaries the stories about the slash and burn techniques used in Equatorial Rain Forests to clear land for agricultural purposes. Without exception, these stories point out the damaging effects that the clearing of old growth trees has on the health of our environment. Science supports the position that this practice harms the environment, and the only mitigation for this is to allow time for the re-growth of mature trees, a process requiring hundreds of years. Planting two, three or more trees to replace these mature trees is nothing more than a band-aid on a deep gash. Losing these trees with their mature root structure to prevent runoff and accumulation of silt in the creeks and streams of the Bell Canyon watershed will be irreplaceable. P11-02

The state is in its fourth year of drought. It asked its citizens to cut water usage by 25%. Regardless of the size of the clear cutting area, any development in watersheds needs to be thoroughly examined. NASA scientists warned this past March that California has one year of groundwater left based on satellite imagining. Where is the water suppose to come from to support more and more vineyard developments? If state citizens are conserving water, why is the state of California willing to give away all that water savings. At the very least, this project deadline needs to be extended .

Thank you for your time. P11-03

Lisa Hirayama
15 year Napa County Resident
707-224-4131

Comment Letter P12

Project 1-15-NAP

I will add my name to the growing protest against this ill conceived and inappropriate 'forest conversion' (read forest destruction).

I live two miles from the site, am a member of the Napa County Land Trust, have led and participated in numerous hikes and outings in this area. P12-01

First, it is damaging to have any development in St. Helena's municipal watershed. You'll recall the disaster that occurred in 1989 when the Viader clearing ended up in Bell Canyon reservoir.

Second, the proposed site borders Land Trust properties permanently preserved. This region is one of the most important biodiversity hot spots in the country. That is documented. We do not need a vineyard islanded among wild lands. This is one of the last places in Napa county where bears and other wild animals can roam freely. This project will restrict their passages and threaten their survival. P12-02

Third, there is a moral and ethical imperative to stop this kind of development. Diminishing resources, climate change and overpopulation are all intimately related. A former director the Bureau of Reclamation has stated that the era of big dam building is over. In the same way the era of clear cutting and fragmenting our forests **should** be over. There are enough wineries and vineyards in Napa county. We can no longer justify the county's destruction for another damn bottle of wine. I don't say this as an outsider but as a vineyard owner and grape grower for the last 40 years. P12-03

Please deny this permit.

Ken Stanton
Angwin Ca

Comment Letter P13

Subject:	THP 1-15-081 NAP
From:	L & L Carr (carr4x4@gmail.com)
To:	Scott.Butler@sbcglobal.net; Kim.Sone@fire.ca.gov; SantaRosaPublicComment@fire.ca.gov;
Date:	Sunday, October 4, 2015 7:16 PM

Ms. Sone and Mr. Butler,

I am writing to ask that an extension be granted to the public comment period for the Bell Canyon Timber Harvest. This development is possibly destructive to the city of St. Helena's water source and should not be approved until further environmental analysis can be done. P13-01

Regardless of the size of the clear cut area on Howell Mountain, the project's cumulative impacts include air quality and carbon sequestration. Data provided by the U.S. Environmental Protection Agency says that globally 17% of the carbon dioxide present in the atmosphere is from deforestation. Nearly 1/5 of the carbon dioxide generated is caused by deforestation as simple as the removal of trees and related activities such as burning. And much of this deforestation is done on a small scale by family farmers for agricultural purposes. P13-02

California is in a fourth year of drought and there is no way to predict when or if it will end. Any new development that will use groundwater or affect the watersheds must be thoroughly evaluated to confirm there is enough water to support the already existing population. The current residents, businesses and vineyards must have priority over any new projects.

Thank you for your consideration. P13-03

Sincerely,

Larry Carr
Napa County resident

Comment Letter P14

Subject:	THP 1-15-081 NAP
From:	Laurence Carr (laurencecarr4@gmail.com)
To:	Scott.Butler@sbcglobal.net; Kim.Sone@fire.ca.gov; SantaRosaPublicComment@fire.ca.gov;
Date:	Monday, October 5, 2015 9:24 AM

Dear Sir/Madam,

Please grant an extension to the public comment period to ensure environmental concerns, alternative and potential consequences have been addressed before the permit is approved.

I am writing as a young adult (18) who is very concerned about the cutting down of trees and the effect it will have on the watershed, wildlife, climate change and global warming. Every tree that is cut down has an impact on air quality and carbon sequestration, not to mention erosion issues that will arise with the cutting down of so many trees on steep slopes. Tree roots help the soil absorb rainfall and filter back down into the water table. One mature oak can consume over 40,000 gallons of water in a year. With the destruction of these trees, there will be more surface runoff, and erosion problems will arise due to the lack of a root system. This will have a direct impact on the aquifer if the soil can't absorb rainfall and replenish itself. The proposed clear cut area borders on the Land Trust Dunn-Wildlake Preserve, one of the most diversified wildlife areas in California. It shares a small lake with the Preserve, and once the area is turned into a vineyard, wildlife that live and move through the area will be increasingly restricted. P14-01 P14-02

We are all connected to our watersheds through every form of life, be it plant or animal. Water is a finite resource, more so especially since California is in a fourth year of drought. I am concerned about how this destructive development will impact my future and my children's future in the scope of climate change and global warming. The immediate effect might not be noticeable, but down the road it will negatively impact the future of Napa Valley and my life here. Please do not allow this project to proceed without a more thorough analysis on the environment. P14-03

Sincerely,

Linnea Carr
Napa Valley College Student
Napa

Comment Letter P15

Oct. 5, 2015

To: Department of Forestry and Fire Protection

135 Ridgeway Ave.

Santa Rosa Ca 95401

Attention: Kim Sone, Cal Fire

Leslie Markham, Forest Practice Manager

Scott Butler, RPF #1851

From: Kellie Anderson

Member/User Howell Mountain Mutual Water Company

445 Lloyd Lane

Angwin CA 94508

Subject: Davis /Friesen THP/TCP #1-15-081-NAP

To whom it may Concern;

Please accept my comments on the proposed Davis/Friesen THP/TCP #1-15-018-NAP. The proposed project will jeopardize the drinking water source, supply and safety for the small, rural, unincorporated community of Angwin.

Angwin's drinking water is provided by the Howell Mountain Mutual Water Company, which is uniquely owned by the residents it serves. Howell Mountain Mutual (HMMWC) serves approximately 400 meters/users in Angwin and is solely dependent on rain fall/surface water which is held in a series of lakes/reservoirs, owned and managed by HMMWC. Angwin residents are dependent upon these lakes as the *only* source of drinking water available. No alternative sources of ground water such as North Bay Aqueduct, or other municipal water districts is available. P15-01

The proposed Davis /Friesen THP/TCH requires all vehicles including logging, milling, earth moving, long term farming, field workers, materials delivery, spray equipment and out house delivery and cleaning equipment to cross the concrete low water crossing in Lake Orville. This concrete low water crossing provides the only access to existing vineyard, residences and the Wild Lakes Napa County Land Trust complex. The proposed project fails to address the cumulative impacts to the stability, safety and reliability of HMMWC reservoir resulting from additional vehicle and equipment crossing of Lake Orville resulting from this project. P15-02

1# While the project documents include a 'Sustainable Pest Management' summary, farming practices none the less, require the transportation of registered pesticides across the Lake Orville low water crossing which will threaten the safety of Angwin's drinking water source. The 'Sustainable Pest Management' document notes the preferred use of OMRI (organic) registered pesticides and fertilizers on vineyard, which are intended to reduce environmental impacts. However the list of materials proposed to be used is not finite and pest pressures can result in the need for conventional pesticides. As an example, the report notes the potential use of the conventional pesticide Acramite. The Acrimite label contains the following lable warning: P15-03

ENVIROMENTAL HAZZARDS this pesticide is toxic to birds, estuarine/marine invertebrates and fish. Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wastewaters or rinsate. This product is toxic to bees exposed to direct treatment. Do not apply this product while bees are actively visiting the treatment area.

2# In addition of the increased/cumulative impacts of pesticide transportation across Lake Orville, the transport of **compost, fertilizers and mycorrhizal inoculants** pose an additional threat to drinking water quality. Any spill, leak, or drift of compost dust or fertilizers (regardless of their organic registration or OMRI listing) increases the cumulative risk of blue green algae blooms in the drinking water supply. This could impact the drinking water quality and reliability of HMMWC. No mitigation measures are provided in this application.

3#. The THC/TPC fails to adequately protect the water supply of the community of Angwin from the cumulative risk of spills and or drift of pesticide, fertilizers and equipment fluids and fuels. While the proposed farming practices call out adherence to all applicable pesticide use laws, the actuality of commercial Vineyard Management Companies (farming for multiple clients at multiple locations), will results in the transportation of fuels, solvents, lubricants, rodenticides, herbicides, insecticides, fungicides, mycorrhizal inoculants, straw, straw wattles, and cover crop seed (intended for used on other vineyard sites), thru the concrete water crossing of the Howell Mountain Mutual Water Company reservoir. This exposure to the safety of the communities' water supply is not justified by the applicant's desire for another dozen acres of wine grapes and bottom line business plan. The applications mitigation measures are inadequate to protect Angwin's the watershed. P15-04

4# The transportation of portable worker outhouses and the outhouse cleaning and pumping equipment, is not addressed in the application. All of us have seen the rolling out houses, door open and banging, roll of toilet paper unfurling down the road, unnoticed or ignored by the truck driver! Or more alarming is the very real risk of spills or leaks from outhouse pumping equipment that will be required to service this project. P15-05

#5 The only reasonable and appropriate project alternative is the 'No Project alternative." The inherent risks to the only drinking water supply for the community of Angwin from this project in unjustifiable.

I urge you to deny the Davis/Friesen THC/TPC 1-15-018-NAP as the cumulative risks to the potable water supply and the economic damage to the small Howell Mountain Mutual Water Company outweigh the benefits to project applicant.

Sincerely, P15-06

Kellie Anderson

445 Lloyd Lane

Angwin CA

707-227-2585

Subject:	project file number: 1-15-081 NAP
From:	Shelle Wolfe (shelle@winedineevents.com)
To:	Scott.Butler@sbcglobal.net; Kim.Sone@fire.ca.gov;
Date:	Monday, October 5, 2015 10:10 AM

Greetings,

I'm writing to express my strong disapproval of such an extravagant disregard for our Valley's watershed by continuously approving the 'clear cutting' of multiple acres of prime forrest for yet another vineyard.

As a resident of St Helena for almost 20 years, I have recently moved my home and business to Napa because of all of the unprecedented and seemingly unlimited growth in St Helena… it has become the eyesore of the Valley, rather than the beautiful and precious gem that it once was. The complete disregard of natural resources and protection of wildlife is mind-boggling to me.

When is enough enough? Do you realize that there is an international organization for Food and Wine Travel that is advising their members to stop visiting Napa Valley due to overgrowth and traffic? It is not just the locals who see this as a problem… but the rest of the world is discovering it also.

As the owner of a Corporate Event planning company here… and a supportive member of the community… I say that we must adopt a sustainable approach to growth and stop saying 'yes' to everything that comes along. Think about the FUTURE of the Valley…its residents, resources, and wildlife.

Thank you for your time, P16-01
Shelle Wolfe

SHELLE WOLFE
Chief Evolution Officer

WINE+DINE EVENTS
The Evolution of Destination Services

P.O.Box 204, St. Helena | CA 94574
707.738.8068 m | 707.259-1898 home ofc.

WINE+DINE is a certified green, carbon neutral business and committed to sustainability.

website | newsletter | vCard | email | facebook

Comment Letter P17

----- Forwarded Message -----
From: Norm Manzer <manzer103@comcast.net>
To: Scott.Butler@sbcglobal.net; Kim.Sone@fire.ca.gov
Sent: Monday, October 5, 2015 11:36 PM
Subject: Bell Canyon Timber Harvest

Dear Scott Butler and Kim Sone,

As residents of St Helena and one more family who gets our only water supply from the City of St Helena's Bell Canyon reservoir, our family is deeply concerned about the proposed clear cutting of timber on the mountainside above our domestic water supply.

Approximately 10+ years ago there were two wineries that put in new vineyards uphill from Bell Canyon, and in spite of the best practices required of these land owners, serious degradation of our reservoir occurred. We are asking that you not allow this timber harvest that can just as easily become a repeat of this prior event. P17-01

As each of these requests come before you for consideration, it is reasonable to assume that individually they don't appear to be at all threatening to anyone or anything, but the track records of other such projects tell a much different story.

Please do not let what appears to be a minimal project unto itself escape your scrutiny and evaluation of the cumulative effect of this somewhat small project. Please deny the request to allow this timber harvest. Thank you for your favorable consideration. P17-02

Sincerely, Norm and Linda Manzer, 103 Camino Vista, St Helena, CA 94574

P.S. We see that October 5 is the deadline for submission of comments. We are just under the wire for October 5.

Comment Letter P18

Dear California Department of Forestry and Fire Protection,

As a member of Davis Estates, I urge you to approve the vineyard project that has been carefully and thoughtfully designed to be productive and conservative in its protection of the surrounding area. From the conception plans through the environmental reports, Davis Estates management and consulting engineers have carved out a minimal space of vineyard all the while preserving the natural habitat and forested hillsides.

If approved, this thirteen acre vineyard will be among other thriving businesses that grow wine grapes in the same hillside area of Angwin in Napa Valley. Just like the successful peers, Davis Estates will employ the same best business practices while farming to maintain the natural landscape and slope erosion control. P18-01

Thank you for your consideration.

Respectfully,

Carie Dunn

October 5, 2015

California Department of Forestry and Fire Protection
P.O. Box 944246
Sacramento CA 94244-2460

To whom it may concern:

I urge you to approve the Davis Estates Friesen project. I have reviewed all 900 pages of documentation and found nothing that should stop your approving this project.

This project represents one three thousandths of a percentage of Napa County and three one hundredths of one percent increase of vineyards in Napa County. By contrast, the federal government (we the people) own 49% of California, add on to that the lands owned by the state, counties and local governments and you have a substantial percentage of land in public ownership. In the United States we have a distinction between public and private lands just so projects like Davis Estates can move forward.

This small vineyard project is not a threat to St. Helena's Bell Canyon Reservoir as the 900 pages attest to.
I understand St. Helena's Public Works/City Engineer Steven Palmer and City Mayor Alan Galbraith's concerns. Hillside viticulture is a specialized subsection of farming most folks know little about. Slopes and soils similar to Davis Estates project have been farmed in Napa Valley and Howell Mountain with no issues for years. Randy Dunn developing his vineyards in 1972 is an excellent example of just such practices. Over the last 40 plus years advances in erosion control measures, products and BMPs (Best Management Practices) have been enormous. Just as it has been with erosion control measures and BMPs with forest practices. Yet understanding their concern is not the same as agreeing with it, which I do not.This extremely impressive 900 page document to convert 5 acres of forest to vineyard and 13.6 overall is still met with opposition. P19-01

It 's important for everyone to understand that hillside vineyards make wines that are a very a important part of our Napa Valley wine industry. Napa Valley wines must now compete in a global marketplace. With our hillsides gaining both national and international acclaim for Napa wines, these grapes are the culmination of our high end agricultural product. A dynamic and healthy wine industry is vital to being the ultimate firewall to urbanization of the Napa Valley.

Here are just a few of the now famous Napa hillside wines: Mayacamas, Stony Hill, Harlan Estate, Bond, Dana, Ovid, Continuum, Ladera, Joseph Phelps, Outpost, Cade, Diamond Creek, Pride and Dunn.

Who's to say that Davis Estates Friesen Vineyard won't be the next new world wide "cult" wine that brings attention and revenue to the Napa Valley wine industry?

P19-01 (Cont.)

Thank you for considering my comments,

Marietta L. Dunn

California Department of Forestry and Fire protection
PO Box 944246
Sacramento, CA. 94244-2460

To whom it may concern:

I urge you to approve the Davis Estates Friesen project. I have reviewed all 900 pages of documentation and found nothing that should stop your approving this project.

This project represents one three thousandths of a percentage of Napa County and three one hundredths of one percent increase of vineyards in Napa County. By contrast, the federal government (we the people) own 49% of California, add on to that the lands owned by the state, counties and local governments and you have a substantial percentage of land in public ownership. In the United States we have a distinction between public and private lands just so projects like Davis Estates can move forward.

This small vineyard project is not a threat to St. Helena's Bell Canyon Reservoir as the 900 pages attest to. P20-01
I understand St. Helena's Public Works/City Engineer Steven Palmer and City Mayor Alan Galbraith's concerns. Hillside viticulture is a specialized subsection of farming most folks know little about. Slopes and soils similar to Davis Estates project have been farmed in Napa Valley and Howell Mountain with no issues for years. Randy Dunn developing his vineyards in 1972 is an excellent example of just such practices. Over the last 40 plus years advances in erosion control measures, products and BMPs (Best Management Practices) have been enormous. Just as it has been with erosion control measures and BMPs with forest practices. Yet understanding their concern is not the same as agreeing with it, which I do not. This extremely impressive 900 page document to convert 5 acres of forest to vineyard and 13.6 overall is still met with opposition.

It's important for everyone to understand that hillside vineyards make wines that are a very an important part of our Napa Valley wine industry. Napa Valley wines must now compete in a global marketplace. With our hillsides gaining both national and international acclaim for Napa wines, these grapes are the culmination of our high end agricultural product. A dynamic and healthy wine industry is vital to being the ultimate firewall to urbanization of the Napa Valley.

Here are just a few of the now famous Napa hillside wines: Mayacamas, Stony Hill, Harlan Estate, Bond, Dana, Ovid, Continuum, Ladera, Joseph Phelps, Outpost, Cade, Diamond Creek, Pride and Dunn. P20-01 (Cont.)

Who's to say that Davis Estates Friesen Vineyard won't be the next new world wide "cult" wine that brings attention and revenue to the Napa Valley wine industry?

Thank you for considering my comments,

Davie Pina
PO Box 333
Oakville, CA 94562
davie@pinavineyards.com

To whom it may concern:

I urge you to approve the Davis Estates Friesen project. I have reviewed all 900 pages of documentation and found nothing that should stop your approving this project.

This project represents one three thousandths of a percentage of Napa County and three one hundredths of one percent increase of vineyards in Napa County. By contrast, the federal government (we the people) own 49% of California, add on to that the lands owned by the state, counties and local governments and you have a substantial percentage of land in public ownership. In the United States we have a distinction between public and private lands just so projects like Davis Estates can move forward.

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Who's to say that Davis Estates Friesen Vineyard won't be the next new world wide "cult" wine that brings attention and revenue to the Napa Valley wine industry?

Thank you for considering my comments,

Rod Field
466 Devlin Road, Napa

Cary Gott
Vineyard & Winery Estates
1407 Main St. #103
St Helena, CA 94574
October 5th, 2015

California Department of Forestry and Fire Protection
P.O. Box 944246
Sacramento CA 94244-2460

Subject: Draft Environmental Impact Report for Davis Estates Friesen Vineyard Project

To whom it may concern:

I urge you to approve the Davis Estates Friesen project. I have reviewed all 900 pages of documentation and found nothing that should stop your approving this project.

This project represents one three thousandths of a percentage of Napa County and three one hundredths of one percent increase of vineyards in Napa County. By contrast, the federal government (we the people) own 49% of California, add on to that the lands owned by the state, counties and local governments and you have a substantial percentage of land in public ownership. In the United States we have a distinction between public and private lands just so projects like Davis Estates can move forward.

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Also, there are hundreds of acres of vineyards in Howell Mountain area that drain into the Bell Canyon reservoir. These 5 additional acres do not represent any new threat to the water supply for St Helena as they will be developed and farmed with best management practices. P22-01

It 's important for everyone to understand that hillside vineyards make wines that are a very a important part of our Napa Valley wine industry. Napa Valley wines must now compete in a global marketplace. With our hillsides gaining both national and international acclaim for Napa wines, these grapes are the culmination of our high end agricultural product. A dynamic and healthy wine industry is vital to being the ultimate firewall to urbanization of the Napa Valley.

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Who's to say that Davis Estates Friesen Vineyard won't be the next new world wide "cult" wine that brings attention and revenue to the Napa Valley wine industry?

Thank you for considering my comments,

Cary Gott
339 Crystal Springs, Rd
St Helena, CA 94574

Cary Gott
Vineyard & Winery Estates
1407 Main St. #103
St Helena, CA 94574
October 5th, 2015

P22-01
(Cont.)

To whom it may concern:

I urge you to approve the Davis Estates Friesen project. I have reviewed all 900 pages of documentation and found nothing that should stop your approving this project.

This project represents one three thousandths of a percentage of Napa County and three one hundredths of one percent increase of vineyards in Napa County. By contrast, the federal government (we the people) own 49% of California, add on to that the lands owned by the state, counties and local governments and you have a substantial percentage of land in public ownership. In the United States we have a distinction between public and private lands just so projects like Davis Estates can move forward.

This small vineyard project is not a threat to St. Helena's Bell Canyon Reservoir as the 900 pages attest to.
I understand St. Helena's Public Works/City Engineer Steven Palmer and City Mayor Alan Galbraith's concerns. Hillside viticulture is a specialized subsection of farming most folks know little about. Slopes and soils similar to Davis Estates project have been farmed in Napa Valley and Howell Mountain with no issues for years. Randy Dunn developing his vineyards in 1972 is an excellent example of just such practices. Over the last 40 plus years advances in erosion control measures, products and BMPs (Best Management Practices) have been enormous. Just as it has been with erosion control measures and BMPs with forest practices. Yet understanding their concern is not the same as agreeing with it, which I do not.This extremely impressive 900 page document to convert 5 acres of forest to vineyard and 13.6 overall is still met with opposition. P23-01

It 's important for everyone to understand that hillside vineyards make wines that are a very a important part of our Napa Valley wine industry. Napa Valley wines must now compete in a global marketplace. With our hillsides gaining both national and international acclaim for Napa wines, these grapes are the culmination of our high end agricultural product. A dynamic and healthy wine industry is vital to being the ultimate firewall to urbanization of the Napa Valley.

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Who's to say that Davis Estates Friesen Vineyard won't be the next new world wide "cult" wine that brings attention and revenue to the Napa Valley wine industry?

Thank you for considering my comments,

Arthur DellaBruna
219 La Crosse Ave.
Santa Rosa Ca. 95409

P23-01
(Cont.)

Comment Letter P24

To whom it may concern,

I urge you to approve the Davis Estates Friesen project. This project represents one three thousandths of a percentage of Napa County and three one hundredths of one percent increase of vineyards in Napa County. Hillside viticulture is a specialized subsection of farming most folks know little about. Slopes and soils similar to the Davis Estates project have been farmed in Napa Valley and Howell Mountain with no issues for years. Over the last 40 plus years advances in erosion control measures, products and BMPs (Best Management Practices) have been enormous.

It 's important for everyone to understand that hillside vineyards make wines that are a very a important part of our Napa Valley wine industry. Napa Valley wines must now compete in a global marketplace. With our hillsides gaining both national and international acclaim for Napa wines, these grapes are the culmination of our high end agricultural product. A dynamic and healthy wine industry is vital to being the ultimate firewall to urbanization of the Napa Valley.

P24-01

Here are just a few of the now famous Napa hillside wines: Mayacamas, Stony Hill, Harlan Estate, Bond, Dana, Ovid, Continuum, Ladera, Joseph Phelps, Outpost, Cade, Diamond Creek, Pride and Dunn. Who's to say that Davis Estates Friesen Vineyard won't be the next new world wide "cult" wine that brings attention and revenue to the Napa Valley wine industry?

Thank you for considering my comments,

Kevin

Kevin Dickenson

Malloy Imrie & Vasconi Insurance Services, LLC
tel: 707-299-2405
fax: 707-226-9024
kdickenson@mivinsurance.com
1584 Clay Street
P.O. Box 640
Napa, California 94559

California License #0C54782

P24-01
(Cont.)

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Comment Letter P25

To whom it may concern:

We have reviewed the proposal and found it to be amenable and compliant. We therefore ask you to approve of the Davis Estates Friesen project.

This small vineyard project is not a threat to St. Helena's Bell Canyon Reservoir. We understand and acknowledge the concerns raised by St. Helena's Public Works/City Engineer, Steven Palmer, and City Mayor Alan Galbraith. However, we feel that these concerns are addressed in the proposal. The extensive 900-page proposal details the conversion of 5 acres of forest to vineyard land, which has a total impact of only 13.6 acres.

Hillside viticulture is a specialized subsection of farming. Slopes and soils similar to the Davis Estates Friesen project have been farmed in Napa Valley and Howell Mountain for many years without issue.

Thank you for considering our comments,

Rich and Leslie Frank
Proprietors
Frank Family Vineyards
1091 Larkmead Lane
Calistoga, CA 94515
E-mail: rfrank@frankfamilyvineyards.com & lfrank@frankfamilyvineyards.com
Phone: 707.942.0859

P25-01

FRANK FAMILY
VINEYARDS

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October 5, 2015

California Department of Forestry and Fire Protection
P.O. Box 944246
Sacramento CA 94244-2460

Sent via email to: sacramentopubliccomment@fire.ca.gov

RE: Draft Environmental Impact Report for Davis Family Estates Friesen Vineyard Project

To whom it may concern:

I urge you to approve the Davis Family Estates project. I have reviewed the 900 pages of documents and found nothing that should stop your approving this project.

This project represents one three thousandths of a percentage of Napa County and three one hundredths of one percent increase of vineyards in Napa County. If there was ever a "de minimis" project this is it. By contrast, the federal government (we the people) own 49% of California, add on to that the lands owned by the state, counties and local governments and you have a substantial percentage of land in public ownership. In the United States we have a distinction between public and private lands just so projects like Davis Estates can move forward. If the citizens of Napa County or the St. Helena government who oppose this project believe that this property is important enough to them then they had the right to purchase it, which they have not. P26-01

If you allow the City of St. Helena to prevail with its request for the "No Project Alternative" and "No Timber Harvest Alternative" you will set a precedent of condemning all private property upstream of any municipal water storage. The City, in effect, is asking you to remedy their lack of wisdom and failure to protect their watershed by a "taking" of property rights of others. You should ask yourselves why St. Helena is only now concerned with their watershed protection. If their concern was legitimate then the City would have a history of acquiring property in the watershed (or at least trying to) when it was for sale in the past or working with property owners in the watershed to ensure clean water flows. There is no such history by the city. This small vineyard project is not a threat to St. Helena's Bell Canyon Reservoir as the 900 pages attest to.

I understand St. Helena's Public Works/City Engineer Steven Palmer and City Mayor Alan Galbraith's concern. Hillside viticulture is a specialized subsection of farming that most folks know little about. I and many others farm slopes and soils similar to the Davis Estates project with no issues. In fact, I farm the very same Aiken, Forward and Kidd complex soils. Over the last 40 plus years the advances in erosion control measures products and BMPs (Best Management Practices) has been enormous, just as it has been with erosion control measures and BMPs with forest practices. Yet understanding their concern is not the same as agreeing with it, which I do not.

Since I first acquired my THP and TCP in 1971 I have watched the environmental community protest and litigate timber harvests to the point that small to medium sized projects are not now economically viable. Timber conversions are a natural and reasonable response to this regulatory nightmare. It saddens me that even this extemely impressive 900 page document to convert 10 acres of forest to vineyard is still met with opposition.

I also think it is important for you to understand that hillside vineyards and the wines made from them are a very important part of the Napa Valley wine industry. Napa Valley wines must now complete in the global marketplace and the wines from our hillsides are gaining both national and international acclaim. Wine grapes are the "climax" agricultural product and the only such ag product that can compete with housing. A dynamic and healthy wine industry is vital to being the ultimate firewall to the urbanization of the Napa Valley. Smith-Madrone was named Winery of the Year by *The Daily Meal* last year and our Riesling was named one of the top twenty dry Rieslings in the world in a book released last summer by Stuart Pigott of England. Here are just a few of the now famous Napa hillside wines: Mayacamas, Stony Hill, Harlan Estate, Bond, Dana, Ovid, Continuum, Ladera, Outpost, Cade, Diamond Creek, Pride and Dunn. P26-01 (Cont.)

Who's to say that Davis Estates' Friesen Vineyard won't be the next new "cult" wine that brings attention to the Napa wine industry?

I may be uniquely qualified to comment on this project. I am a citizen of St. Helena. I developed Smith-Madrone Vineyards and Winery on the top of Spring Mountain in 1971 by reclaiming a long abounded vineyard which required both a THP and a TCP. I've successfully farmed approximately 38 acres of steep (up to 34% slopes) mountain vineyard for these last 44 years. Bothe Napa Valley State Park is my neighbor, on my property's northern and eastern boundaries, for approximately one mile: we've successfully farmed next to them, without any

issues, for 44 years. In 2000 I was granted and used a "less than 3 acre conversion" permit and I currently have a Non-Industrial Timber Management Plan. I was appointed to the Napa River Watershed Taskforce by the Napa County Board of Supervisors in 1998 and I was also appointed by the Napa County Supervisors to the Steering Committee to revise The Napa County General Plan that was completed in 2008. I am a past Board member of the Napa Valley Vintners and the Napa County Farm Bureau. I taught Viticulture and Enology for several years at Napa Valley College and Santa Rosa Junior College for another 10 years or so in the evening program.

P26-01 (Cont.)

Thank you for considering my comments,

Stuart Smith
General Partner
Smith-Madrone Vineyards & Winery
4022 Spring Mountain Road
St. Helena CA 94574
707/963-2283

To whom it may concern:

I urge you to approve the Davis Estates Friesen project. I have reviewed all 900 pages of documentation and found nothing that should stop your approving this project.

This project represents one three thousandths of a percentage of Napa County and three one hundredths of one percent increase of vineyards in Napa County. By contrast, the federal government (we the people) own 49% of California, add on to that the lands owned by the state, counties and local governments and you have a substantial percentage of land in public ownership. In the United States we have a distinction between public and private lands just so projects like Davis Estates can move forward.

This small vineyard project is not a threat to St. Helena's Bell Canyon Reservoir as the 900 pages attest to.
I understand St. Helena's Public Works/City Engineer Steven Palmer and City Mayor Alan Galbraith's concerns. Hillside viticulture is a specialized subsection of farming most folks know little about. Slopes and soils similar to Davis Estates project have been farmed in Napa Valley and Howell Mountain with no issues for years. Randy Dunn developing his vineyards in 1972 is an excellent example of just such practices. Over the last 40 plus years advances in erosion control measures, products and BMPs (Best Management Practices) have been enormous. Just as it has been with erosion control measures and BMPs with forest practices. Yet understanding their concern is not the same as agreeing with it, which I do not.This extremely impressive 900 page document to convert 5 acres of forest to vineyard and 13.6 overall is still met with opposition.

It 's important for everyone to understand that hillside vineyards make wines that are a very a important part of our Napa Valley wine industry. Napa Valley wines must now compete in a global marketplace. With our hillsides gaining both national and international acclaim for Napa wines, these grapes are the culmination of our high end agricultural product. A dynamic and healthy wine industry is vital to being the ultimate firewall to urbanization of the Napa Valley. P27-01

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Who's to say that Davis Estates Friesen Vineyard won't be the next new world wide "cult" wine that brings attention and revenue to the Napa Valley wine industry?

Thank you for considering my comments,

Best regards,
May-Britt Malbec

NOTRE VIN

1127 Pope Street, Suite 105
Saint Helena, California 94574
Phone 707.963.9606
Fax 707.963.0906
www.notrevin.com

P27-01
(Cont.)

To whom it may concern:

I urge you to approve the Davis Estates Friesen project. I have reviewed all 900 pages of documentation and found nothing that should stop your approving this project.

This project represents one three thousandths of a percentage of Napa County and three one hundredths of one percent increase of vineyards in Napa County. By contrast, the federal government (we the people) own 49% of California, add on to that the lands owned by the state, counties and local governments and you have a substantial percentage of land in public ownership. In the United States we have a distinction between public and private lands just so projects like Davis Estates can move forward.

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Who's to say that Davis Estates Friesen Vineyard won't be the next new world wide "cult" wine that brings attention and revenue to the Napa Valley wine industry?

Thank you for considering my comments,

Louis P. Ciminelli

1260 Summit Lake Dr.
Angwin, CA, 94508

LPCiminelli
CONSTRUCTION MANAGEMENT ■ INFRASTRUCTURE ■ GENERAL CONTRACTING

Louis P. Ciminelli ■ CEO & Chair
lpc@lpciminelli.com ■ Tel 716.855.1200

Please consider the environment before printing this email.

P28-01
(Cont.)

Oct. 5, 2015

To: William Solinsky, Forester CAL FIRE, Resource Management PO Box 944246, Sacramento, CA 94244-2460
SacramentoPublicComment@fire.ca.gov

To: Leslie Markham, CAL FIRE, North Coast Region Headquarters 135 Ridgway Avenue, Santa Rosa, CA 95401
SantaRosaPublicComment@fire.ca.gov

Re: THP NAP-1-15-081

Dear Mr. Solinsky and Ms. Markham,

I appreciate the opportunity to comment on the THP. While it endeavors to inform of the full extent of GHG emissions that will result from land cover change, including destruction of 14 acres gross natural forest to net 10.5 acres vineyard, it fails to mitigate those emissions in a manner consistent with the current reality of a foreshortened time horizon to protect a habitable climate for us on earth.

P29-01

Key climate protection metrics, including the 100-year time horizon time, date back to the Kyoto Protocol in 1997. It was assumed then that critical climate change was at least a century away. The most recent IPCC Assessment Report, AR 5 (2013) indicates that by 2035, the global mean temperature will rise to a level at least 1.5 deg C warmer than in 1750 in only two decades instead of 100 years into the future. Kyoto metrics also did not recognize the importance of black carbon, a short lived climate forcer now understood to be the second most important climate pollutant contributing to global warming. A 20-year time horizon is what we have to work with, not 100 years, for real GHG mitigation to protect against crossing the climate tipping point. This IS/MND does not recognize this reality, and does not attempt to address it.

> Why, when science and fact indicate a 20-year time horizon for avoiding the climate tipping point, does the THP ignore it in favor of a dangerously outdated metric?

An Oxford research team recently concluded that trees are by far the best negative emissions technology (NET) available today[1]. Yet Napa County's General Plan allows 12,500 acres to be developed by 2030. Presumably much of this expansion is meant to take place in wooded hillsides. Indeed recent vineyard conversions approved by the County permit extensive clear cutting of forests. Forests are hard-

working, peace-loving partners in tamping down the harmful effects of our carbon pollution.

Where climate is concerned, forests are no longer "renewable." For practical purposes, the time required for their renewal has ceased to exist. In 2009, the Copenhagen Accord recognized that the increase in global temperature should be kept below 2 deg C to combat climate change. We are currently 0.9 deg C warmer, with another 0.8 degrees of climate-forcing inertia in the pipeline. Bill McKibben's *Global Warming's Terrifying New Math*[2], published in 2012, elucidates data from the Carbon Tracker Initiative: In order not to exceed 2 deg C, we may not pour any more than 565 gigatons of CO2 into the atmosphere. That's our carbon budget. According to CO_2Now.org, globally, in 2013, CO2 emissions due to fossil fuel use and cement production were 36 gigatons[3]. Assuming business-as-usual here is 2015, that leaves us with about 13 years before our 565 gigaton budget is exceeded. Because of this extreme imbalance in atmospheric CO2, forests must not be cut down and replanted another day. Their carbon sequestration and storage services are needed today and every day for the next 13 years and beyond. Policies inimical to this have a lot of explaining to do.

While California has the nation's most ambitious climate goals, Napa County is a laggard in climate protections. It has no a binding Climate Action Plan. Governor Brown issued an executive order in April to aggressively cut GHG emissions 40% below 1990 levels by 2030. To complicate the matter, a recent study commissioned by CARB found that instead of forests and other vegetation providing a carbon sink, land use in California actually adds 5-7% to its carbon footprint. According to the Nature Conservancy, there's no way to meet the state's ambitious climate targets without dealing with deforestation[4]. P29-01 (Cont.)

Worldwide, manufacturers and suppliers are making pledges to stop cutting down forests. The public's growing awareness of the value of complex, thriving forest ecosystems won't allow it. Protections for environmental health are protections for public health. Today, responsible companies insure that deforestation is avoided for growing soy, corn, and palm oil, to name a few. In some instances, where industry groups or government are unable to make the change happen, individual leaders are stepping up to make the right choice. Such was the recent case of a CEO of the world's largest palm oil corporation, Wilmar[5]. Yet here at home, CAL FIRE does little to discourage the evisceration of its own forests for growing wine grapes. Deforestation is the norm in Napa County and it continues unabated.

> Why, when we should be conserving forests and planting them like there is no tomorrow, is CAL FIRE permitting their destruction?

The GHG analysis in 4.7.3 discusses CO_2e in general.

> What are methane and nitrous oxide emissions? P29-02

What is the black carbon loading? P29-02 (Cont.)

The THP estimates that 1,181 MT CO2e would be emitted due to construction-related vegetation removal and soil preparation (Table 4.7-1).

What are the associated CH_4 and N_2O emissions? What are the varieties of impacts associated with biomass disposal?

Carbon stored in grassland and brush/shrubland and chaparral is a fraction of that stored in forestland. Why, as an alternative to uprooting the trees, can other land covers not be used instead for the vineyard expansion? P29-03

What is GHG from loss of sequestration? Over what time horizon?

The THP includes no analysis of vineyard replant GHGs.

Why is this important source of GHG not included? P29-04

What are biomass disposal assumptions and are the prescribed methods enforceable?

The THP assumes a 100-year time horizon for mitigation of CO2e.

This is an invalid premise today. All sources of atmospheric carbon pollution, regardless of source, need to be accounted for and completely mitigated. Where is discussion of short-lived climate pollutants (SLCP)? (Reference the draft CARB strategy pending finalization in 2016.)

Where in the Napa County General Plan EIR – or DEIR – is significant unavoidable GHG impacts justified? And, is that justification legitimate today given current science and facts (and, increasingly, legislation) supporting the urgent need to slash our carbon pollution? P29-05

Sincerely,

Jim Wilson

5000 Monticello Road

Napa, CA 94558

1. http://www.bloomberg.com/news/articles/2015-02-03/scientists-seeking-to-save-world-find-best-technology-is-trees

2. http://www.rollingstone.com/politics/news/global-warmings-terrifying-new-math-20120719

3. http://co2now.org/Current-CO2/CO2-Now/global-carbon-emissions.html

4. http://www.motherjones.com/environment/2015/05/save-climate-california-needs-save-its-forests

5. http://grist.org/food/48-hours-that-changed-the-future-of-rainforests/

P29-05
(Cont.)

To whom it may concern:

I urge you to REJECT the Davis Estates Friesen project. I have reviewed all 900 pages of documentation as well as Save Rural Angwin, the Land Trust of Napa County, the St. Helena's Public Works/City Engineer Steven Palmer and City Mayor Alan Galbraith's concerns - and I share those concerns.

We are neighbors to the proposed vineyard site as well as members of the Land Trust, and in fact, we consider a major portion of our own property to essentially be an extension of the wild lake preserve as most of our acreage is raw land that we have no intention of ever developing. P30-01

Mr Davis disingenuously sites Randy Dunn as en example of safe hillside viticulture and implies that Mr Dunn is a proponent of his vineyard development when in fact Mr Dunn staunchly opposes the project.

The threat to the Land Trust and all of its incredibly rich and diverse flora and fauna, as well as the risk to St Helena's water supply is simply too great to justify "another vineyard," of which there is certainly no shortage in Napa Valley. I respect a landowner's right to do what he or she wishes with their own property, but not when it infringes on the public good or the safety of a municipal water supply or the preservation of one of the most biologically diverse areas in all of America. I urge you to reject the proposal for this vineyard development. P30-02

Thank you very much for considering my comments,

Christopher Jambois
2625 Summit Lake Dr.
Angwin, CA 94508

Chris Jambois
Black Sears
707-889-1243
www.blacksears.com

UNIT, ~~FG, WQ,~~ ER, W, RPF

From: Sone, Kim@CALFIRE
Sent: Tuesday, October 06, 2015 9:39 AM
To: Grete Orsoe
Cc: Dan@apotherx.com; Santa Rosa Public Comment@CALFIRE
Subject: RE: Angwin Deforestation; Walt Ranch; 1-15-08 NAP

Hi Grete
You have sent public comment to an incorrect email address. Public comment letters must be submitted to santarosapubliccomment@fire.ca.gov
I have cc'd the correct address as a courtesy.
Thanks,

Kimberley Sone
Unit Forester
CAL FIRE
Sonoma-Lake-Napa Unit
2210 West College Ave
Santa Rosa, CA 95403
(707) 576-2344 office
(707) 889-4217 cell

RECEIVED
OCT - 6 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

From: Grete Orsoe [mailto:gorsoe@cbnapavalley.com]
Sent: Sunday, October 04, 2015 4:25 PM
To: Sone, Kim@CALFIRE
Cc: Dan@apotherx.com
Subject: Angwin Deforestation; Walt Ranch;

P31-01

Dear Madame: I am born and raised in the western portion of Napa on 140 acres of forest land off Dry Creek Road. My brother and I used to ride through the woods and even across the valley to visit friends. My Father had a well respected feed and milling business, which was successful due to the rural nature of this valley.

Everything changes, and that is a given. But when the Agricultural Preserve was put into effect in the '60's, this was an indication by the local citizens that everything was to be done to encourage the rural nature of this Valley. This is one of the reasons the wine industry has been so incredibly successful, and the valley continues to draw visitors from all over the world. However, the entire aura of the valley is changing as more and more entrepreneurs wish to profit from what has gone before them.

This utopia will no longer exist, unless we as responsible citizens, accept the responsibility for speaking our minds and telling those who make government decisions that careful thought must be put into controlling future winery and vineyard expansion. Our roads are crumbling; our forests are disappearing; our water supply is being threatened; and people continue to want to be allowed to put in more vineyards and new wineries. WE must stop and reflect on what it is we are doing to the Napa Valley before we approve any further plans to create new or expand on existing hospitality centers, wineries etc. If the authorities continue to approve these new encroachments upon county lands, the beautiful Napa Valley will cease to exist.

Let us all give serious thought to the future! Sincerely, Grete Orsoe

P31-01
(Cont.)

RECEIVED
OCT - 6 2015
COAST AREA OFFICE
RESOURCE MANAGEMENT

Santa Rosa Public Comment@CALFIRE UNIT, ~~FG, WQ~~, ER, LW, RPF

From: Geoff Ellsworth <geoffellsworth@yahoo.com>
Sent: Monday, November 09, 2015 3:49 PM
To: Sacramentopubliccomment@calfire.ca.gov; Santa Rosa Public Comment@CALFIRE
Cc: Mike Hackett
Subject: Davis Friesen Vineyard THP/TCP/DEIR 1-15-081 NAP P32-01

I oppose the Davis Friesen vineyard THP/TCP/DEIR on the grounds that this project would:

1. Impact the Bell Canyon Watershed which is a water source for St. Helena, the town I live in. It would also impact the Napa River.

2. Alternatives to this proposed project have not been examined. P32-02

3. GHG measurement mitigations are invalid based on submission by the Quercus Group P32-03

4. The CEQA process has been violated due to lack of review of public documents. P32-04

5. It would impact the Western Pond Turtle habitat. P32-05

6. Cumulative Impacts have not been addressed, also a CEQA violation. P32-06

7. Violates the Clean Water Act. P32-07

8. California Executive Order B-30-15 implementation plans have been ignored.

Thank you P32-08
Geoff Ellsworth
St. Helena, Ca

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SECTION 3.0

RESPONSES TO COMMENTS

SECTION 3.0

RESPONSES TO COMMENTS

3.1 INTRODUCTION

The following responses have been prepared for each bracketed comment included in **Section 2.0** of this Response to Comments document. General comments about the project and issues that were raised by multiple commenters are addressed first in **Section 3.2**. **Section 3.3** provides individual responses to each comment received from a local, State, or federal agency or non-profit organization. **Section 3.4** responds to comments received from private individuals.

3.2 GENERAL RESPONSES

Response 1: Expressions of Opinion/Non-Substantive Comments

Summary of Comments

Many of the comments received were expressions of opinion either for or against the development of vineyards on the Davis Friesen property (Proposed Project). Some comments did not raise a substantive environmental issue. Several other comments were statements of information related to the commenter, such as a mailing address.

Response

To warrant a detailed response in the Final EIR, comments must fulfill two minimum requirements: 1) the comments must raise a substantive environmental issue, and 2) they must be related to either the decisions to be made by the Lead Agency and Responsible Agency based on the EIR or to the expected result of these decisions. Responses have not been provided to comments that do not raise significant environmental issues; however, all comments are in the administrative record for the project and will be considered by the California Department of Forestry and Fire Protection (CAL FIRE) and Napa County in making their decisions.

Response 2: Adequacy of the Draft EIR and THP

Summary of Comments

Several comment letters stated the Draft EIR did not adequately analyze the environmental impacts, evaluate an adequate range of alternatives, or provide a sufficient analysis of cumulative impacts. In addition, commenters contended that procedural requirements set forth in the California Environmental Quality Act (CEQA) and the CEQA *Guidelines* were not properly

followed during the Draft EIR process. Other commenters contended that the timber harvest plan (THP) process has not been met.

Response

Draft EIR

The Draft EIR and this Final EIR were prepared in accordance with CEQA (California Public Resources Code § 21000-21178) and the CEQA *Guidelines* (California Code of Regulations [CCR], Title 14) to provide the Lead Agency (CAL FIRE) with an informational document to be used in the planning and decision-making process, as stated in Section 1.3 of the Draft EIR. In accordance with CEQA *Guidelines* § 15082, a Notice of Preparation (NOP) was circulated to the public, local, State, and federal agencies, and other known interested parties for a 30-day public and agency review period which began on June 24, 2014 (included as Appendix A of the Draft EIR). The environmental resources determined during scoping to have the potential to be significantly affected by the Proposed Project, which were therefore addressed in detail in the Draft EIR, include: Aesthetics, Agriculture and Forestry Resources, Air Quality, Biological Resources, Cultural Resources, Geology and Soils, Greenhouse Gas Emissions, Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Noise, and Transportation and Circulation. The baseline environmental setting for each resource along with the relevant federal, State, and local regulatory laws, codes, ordinances, and standards are described in Section 4.0 of the Draft EIR, as well as mitigation measures where appropriate to reduce impacts to less-than-significant levels, as required by CEQA *Guidelines* § 15126.4. A range of reasonable alternative projects that could feasibly attain most of the objectives of the Proposed Project and comparative merits of the alternatives are presented in Section 5.0 of the Draft EIR, pursuant to CEQA *Guidelines* § 15126.6. Pursuant to CEQA *Guidelines* § 15126.2, discussions regarding cumulative impacts; secondary impacts, including potential impacts resulting from growth inducement; and significant irreversible changes to the environment are included in Section 6.0 of the Draft EIR. A list of preparers is provided in Section 7.0 of the Draft EIR, pursuant to CEQA *Guidelines* § 15129. The Draft EIR was submitted to the State Clearinghouse and other interested parties on August 21, 2015 (SCH# 2014062076), initiating a 45-day public comment period that ended on October 5, 2015.

This Final EIR includes comments received on the Draft EIR, responses to those comments, and appropriate revisions to the Draft EIR as a result of comments in accordance with CEQA *Guidelines* § 15132. Collectively, the Draft EIR and Final EIR inform the Lead Agency and public of the potential significant environmental effects of the Proposed Project and identify measures, methods, and/or practices that can be employed to avoid or significantly reduce environmental impacts, pursuant to the General Concepts of CEQA *Guidelines* (§ 15002).

THP

The Forest Practice Rules (14 CCR 1037.5) regulate the role, composition, and duties of the THP review team. The function of the Review Team is to assist the Director in "determining if plans are in conformance with Board rules and to evaluate the potential environmental impacts of timber operations" (1037.5 (b)). The Review Team has thus far acted in accordance with the requirements of Section 1037.5, including:

> "(g) (1) *Before the Director accepts a plan for filing* or before the fifth working day after filing, a review team shall review the plan.
> (g) (2) After the preharvest inspection and before the Director's determination on a plan, the review team shall meet to review all the information on the plan and develop a recommendation for the Director." (*emphasis* added)

The Friesen THP (File Number 1-15-081 NAP) was accepted by Review Team for filing on July 31, 2015. The preharvest inspection (PHI) occurred on August 25, 2015, and the second Review Team meeting occurred on October 29, 2015. In accordance with Section 1037.5, the public comment period remained open 10 days after the close of the Second Review (November 9, 2015), and CAL FIRE began responding to comments. The Review Team has found the Davis Friesen THP to be in conformance with the Forest Practice Rules, but it is not responsible for approving the plan; the Director has this responsibility. All public comments are considered by the Director, along with the recommendations of the Review Team, prior to making a decision on the THP.

Response 3: Aesthetics

Summary of Comments

Several commenters felt that the development of the Proposed Project would detract from the rural aesthetic character of the project site.

Response

An alteration of the landscape from natural habitat to a vineyard is not considered, in itself, a significant impact to the physical environment. Rather, the analysis in the EIR focuses on the extent to which the alteration of the landscape will result in significant impacts to scenic resources or a substantial degradation in the existing visual character of the landscape, in accordance with CEQA *Guidelines*. CAL FIRE acknowledges that the aesthetic character of a vineyard differs from the aesthetic character of natural habitat. Those who reside nearby may prefer one visual landscape to another. Such preferences may be both sincere and strongly held. Such preferences do not, however, constitute an environmental impact that is the focus of CEQA analysis. Rather, the CEQA analysis focuses on whether the Proposed Project would have a substantial adverse effect on a scenic vista, or substantially damage scenic resources.

A change in the visual character of the landscape from natural habitat to a vineyard is not considered substantially adverse.

Section 4.1.4 provides an analysis of several potential impacts to aesthetic resources that could result from the Proposed Project. However, each of these impacts is less-than-significant in accordance with CEQA *Guidelines* § 15064, which clarifies how an environmental professional with specific training in a particular area of environmental review can make a determination of level of significance. An oblique view of the project site is provided in Figure 4.1-1 of the Draft EIR to demonstrate that no existing residences would be able to view the project site due to topography. As acknowledged in Impact 4.1-3, the "project site would be viewable from a hunting lodge located to the west of the project site on the Preserve." As discussed further in **Response to Comment A6-08**, below, the hunting lodge is not currently used by the Napa Land Trust. There are existing vineyards located along Friesen Drive and the Proposed Project would provide similar views as already found near the Preserve in the immediate vicinity. Although proposed vineyard Block A would be visible from the entrance to the Land Trust Preserve, this does not constitute a "substantial adverse effect on a scenic vista" or a "substantial degradation of the visual character of the site." Therefore, a less-than-significant impact would occur.

In regards to commenters' concerns regarding standard farming practices such as reflective tape, it is important to note Napa County Code Chapter 2.94 Agriculture and Right to Farm which states:

> "No existing or future agricultural activity, operation or facility, or any of its appurtenances, conducted or maintained for commercial purposes in a manner consistent with proper and accepted customs and standards, as established and followed by similar agricultural operations in the same locality, shall be or become a nuisance, public or private, due to any changed condition in or about the county, after the same has been in operation for more than three years if it was not a nuisance at the time it began."

Similarly, per the Napa County General Plan AG/LU-15:

> "The County affirms and shall protect the right of agricultural operators in designated agricultural areas to commence and continue their agricultural practices (a "right to farm"), even though established urban uses in the general area may foster complaints against those agricultural practices. As the project site is in the vicinity of other established vineyards, all practices and operations shall be similar to the locality and thus stand under this County code."

The property's existing zoning of Agricultural Watershed (AW) allows for the existing and proposed uses of the subject property, including open space, timber harvest, and agricultural production. Thus, the proposed use of the property for vineyards is consistent with the existing zoning of the parcel, consistent with the AW zoning of the surrounding parcels, and does not create a significant aesthetic impact under the County Code of Ordinances or CEQA.

Response 4: Location near Dunn-Wildlake Preserve

Summary of Comments

Some comments stated that the Draft EIR did not adequately acknowledge that the project site is surrounded by Napa Land Trust's open space and undeveloped properties. Commenters expressed concern over the proximity of the Proposed Project site to the Dunn-Wildlake Preserve as it relates to visual impacts, recreation, water quality, and wildlife habitat.

Response

Some comments stated the Draft EIR did not adequately acknowledge that the project site is surrounded by Napa Land Trust's open space and undeveloped properties. As stated in Section 3.2 of the Draft EIR, "land uses in the vicinity of the property include vineyards, rural residences, and open space. The 3,030-acre Dunn-Wildlake Ranch Preserve, which is managed by the Land Trust of Napa County, is located to the west, south, and east of the property; the preserve is adjacent to the west and east borders of the property." Thus, the Draft EIR clearly states that the Dunn-Wildlake Ranch Preserve (Preserve) borders the property on two sides and is part of an overall open space area in the project site vicinity. Further, the Draft EIR clearly states that open space is one of the permitted uses under existing county zoning, as are the proposed timber harvest and agricultural use of the parcel. The property is under the jurisdiction of the County; therefore, only the County's General Plan and Zoning Ordinance are applicable to development on the site. The property is zoned as Agricultural Watershed (AW); the surrounding lands are also under the jurisdiction of the County and are all similarly zoned AW. Although not proposed under the project, allowable land uses without a use permit under the AW zoning include agriculture, one single-family residence per lot, small residential care facilities, family day care homes, guest cottages, and other uses as discussed in Section 4.10 of the Draft EIR. To not approve a proposed land use that is consistent with the zoning code could result in an inverse condemnation of the property, if the project is otherwise consistent with the General Plan and County Code of Ordinances. Refer to **General Response 18**, below, regarding the consistency with the Napa County General Plan.

The overall Proposed Project has been laid out to minimize visual impacts and other impacts on surrounding land uses. Although proposed Block A would be visible from the current parking area for the Preserve (land owned by the Napa Land Trust), one must pass through the project site on Friesen Drive to reach this area of the Preserve. Friesen Drive is a private road that

bisects the property owned by the Applicant. Thus, to access the Preserve and the parking area, one would have to travel along Friesen Drive and pass through not only the project site, but also multiple parcels with various other compatible land uses including open space, vineyard, and other agricultural uses, all of which are consistent with the existing AW zoning. As such, any development of the property as permitted under the AW zoning would be visible from Friesen Drive and from the Preserve. This does not constitute a significant impact in and of itself, consistent with CEQA *Guidelines* Appendix G. See **General Response 3** for a discussion on aesthetics as it relates to the Proposed Project.

Some commenters claim there is recreational value of the subject property. While the property site is in close proximity to Napa Land Trust's Preserve, the Land Trust has never owned the land and it has never been used for recreation. In fact, an existing barbed wire fence installed by a previous property owner surrounds much of the property line. Therefore, the Proposed Project would not remove an active recreational area or block access to the Preserve for recreational purposes.

In addition, there is a reservoir known as Wild Lake located approximately 200 feet northwest of the subject property on Napa Land Trust property. Wild Lake is at an elevation of approximately 2,085 feet amsl, whereas the nearest vineyard block (Block A) is at an elevation of 2,068 feet amsl. Therefore, this reservoir is up-gradient from and therefore unlikely to be hydrologically influenced by the Proposed Project. However, please see **General Response 5** for a discussion of erosion and sedimentation.

The Proposed Project would not result in direct conflicts with the Dunn-Wildlake Preserve, as all impacts such as traffic, noise, and air quality were reduced to less-than-significant levels. In addition, impacts to habitat fragmentation and wildlife corridors were reduced to less-than-significant levels, which will ensure there are no significant impacts to wildlife that may utilize the Preserve. See **General Response 14** for a discussion on habitat fragmentation, including a figure showing the project parcel's open space in relation to the Preserve.

Response 5: Erosion and Sedimentation

Summary of Comments

Several of the comments expressed concerns about the potential for an increase in sediment load to the Bell Canyon Reservoir watershed and Napa River watershed. In addition, several commenters stated that the Proposed Project would not be in compliance with the Napa River Watershed Sediment Total Maximum Daily Load (TMDL), which requires a 50 percent reduction in sediment from the watershed as a whole.

Response

The Napa River Watershed Sediment TMDL and Habitat Enhancement Plan specifically states that an "effective means of reducing sediment delivery from sheetwash erosion would be for all vineyards to meet the performance standards specified under the Napa County Conservation Regulations (Chapter 18.108)" (Napolitano et. al, 2007). The Proposed Project is designed to comply with Chapter 18.108, and is therefore compliant with the Napa River Sediment TMDL. The Draft EIR recognizes the existence of the Napa River Sediment TMDL and its implications for the Proposed Project. As the Draft EIR states on page 4.9-19: "Since the mainstem Napa River has been listed as sediment-impaired according to Section 303(d) of the CWA, no net increase in sediment yield from the project site is allowed to occur from development of the Proposed Project."

The Draft EIR presents an analysis of pre- and post-project sedimentation in Table 4.6-2 in Section 4.6. Napa County procedures for vineyard development specify that the Universal Soil Loss Equation (USLE), as adapted for vineyards, be used to estimate soil loss from a proposed vineyard. According to the USLE analysis for pre- and post-project sediment runoff, there is a net decrease in sediment runoff from the project site. Under current conditions, the 13.6± acre project site produces a total of 20.9 tons per year of eroded sediment (OEI, 2014). Under the Erosion Control Plan (ECP; Appendix B), the USLE predicts the Proposed Project will produce 15.1 tons per year, representing an approximately 25 percent decrease in sedimentation over baseline conditions. This exceeds the requirements of and thus is in compliance with the Napa County General Plan Policy CON-48, which requires project-specific sediment management plans which, at a minimum, maintain pre-development sediment erosion conditions. Per the San Francisco Bay Regional Water Quality Control Board (RWQCB) which issued the Napa River TMDL, these County Regulations are "effective in the control of excessive rates of sediment delivery resulting from vineyard surface erosion." The project ECP and USLE calculations prepared by Matt O'Connor (Certified Engineering Geologist) of O'Connor Environmental, Inc. demonstrate that the Proposed Project would limit potential erosion and be in compliance with all local and regional water quality and sedimentation policies. Additionally, as of July 10, 2015, the Napa County Resource Conservation District (RCD) determined that the ECP meets all technical adequacy requirements.

The methodology used to compute the sedimentation risk follows the standards set forth by the Natural Resources Conservation Service (NRCS) USLE manual *Predicting Rainfall Erosion Losses: A Guide to Conservation Planning* (USDA, 1978) in addition to the *USLE – Special Applications to Napa County, CA* (USDA, 1994). The ECP as designed follows generally accepted best management practices (BMPs) to reduce the likelihood of construction and post-construction increases in sediment.

All erosion control systems for vineyards require monitoring and maintenance to function properly. The ECP includes monitoring and maintenance requirements in accordance with Napa County Code 18.108.135. In addition, supervision by qualified engineers during construction and annual winterization inspections by Napa County RCD staff will ensure measures are installed and functioning properly.

Because the Proposed Project is in compliance with Napa County Code Chapter 18.108 and will result in a decrease in sediment loads in the Napa River watershed, the project is in compliance with the TMDL requirements. Calculations are done on a project-wide basis due to the Napa County General Plan Policy CON-48 that requires projects to "maintain pre-development sediment erosion conditions" for the overall project. Any marginal increases in sediment to waters of the US are offset by decreases in sedimentation from other vineyard blocks. Sediment increases from any single vineyard block do not indicate a net increase in sediment to any one water of the US. Refer to 4.9.3-2 within the Draft EIR for an in-depth discussion on runoff, control measures and associated analysis methodology.

Response 6: Pesticide Use

Summary of Comments

Several commenters stated that construction or operation of the Proposed Project could expose sensitive receptors to hazardous materials or cause the release of agrichemicals into the environment. Some comments expressed concerns that the proposed mitigation measures were inadequate to protect humans and the natural environment from vineyard chemicals, including pesticides and fertilizers.

Response

Consistent with the CEQA *Guidelines* and Napa County's Local Procedures (February 2015), an impact is considered significant if the Proposed Project would:

- Create a significant hazard to the public or the environment through routine transport, use, or disposal of hazardous materials; or
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment.

As discussed in Section 4.8.3-2 of the Draft EIR, the Proposed Project may have significant impacts during construction and operation due to the storage of hazardous materials, potential release of hazardous materials, use of pesticides, and generation of waste oil. The Proposed Project has made it a priority to protect the watershed from potential hazardous materials impacts through incorporation of numerous features into the project design. Operation of the

proposed vineyard would utilize Integrated Pest Management (IPM) techniques in order to minimize the use of pesticides and herbicides to the maximum extent feasible. The IPM Plan was provided for public review as Appendix J of the Draft EIR. Following the IPM Plan will ensure that any impacts due to agrichemicals are reduced through proper use, storage, and minimization measures.

Although the project design has attempted to minimize use and accidental discharge of hazardous materials, there is the inherent risk of hazardous materials incidents in all vineyard development and operation practices found throughout Napa County, including the Proposed Project (refer to Impacts 4.8-1 to 4.8-5 of the Draft EIR). These impacts will be mitigated through the implementation of Mitigation Measures 4.8-1 through 4.8-3 (THP Mitigation #9 through #11), standard operating procedures (SOPs) for filling and servicing construction equipment and vehicles, SOPs regarding the use and application of pesticides, and proper storage, use, and transportation of waste oil storage containers.

Further, the use of stream setbacks which meet County and CAL FIRE standards to protect watercourses within the project site, protect riparian habitat, preserve wildlife corridors, and filter sediment is discussed in Section 4.4 Biological Resources. The same stream setbacks are also an important component of reducing any indirect hazardous materials impacts of vineyard operation to less-than-significant levels, as discussed in Impact 4.8-3 of the Draft EIR. No vineyard operation or maintenance activities would occur in the buffer zones. During storm events, the buffer zone would act as a filter to reduce the potential for sediment, petroleum products, pesticides, herbicides, mildewcides, or fertilizers to reach waters of the U.S. and drainages on-site. The University of California Division of Agricultural and Natural Resources (UC ANR) Grismer et al. study confirms the effectiveness of stream setbacks and vegetated filter strips as an important natural mechanism to reduce off-site sediment transport, sometimes by as much as 75 to 100 percent. In addition, this same peer-reviewed publication found that vegetated filter strips similar to those proposed in this project can capture 26 to 100 percent of pollutants depending on the type of pollutant or nutrient and the vegetation type (Grismer et al, 2006). Therefore, the use of stream setbacks and vegetated turnaround avenues to reduce pollutant transfer and nutrient loading to receiving waters is an effective and appropriate mitigation measure that is consistent with Napa County Code (Section 18.108.025), CEQA *Guidelines* (§ 15126.4(a)), and Napa County General Plan policies (CON-18, CON-45, and CON-50).

As explained in 4.8.1-3 of the Draft EIR, there would be no permanent storage of fertilizer or pesticide materials on-site. Sustainability procedures outlined in the IPM program would minimize the necessity of off-site materials. The use of inputs on-site, when necessary, would use organic (OMRI-certified) materials where appropriate. All non-biodegradable wastes and residual materials would be transported off-site in closed containers. Additionally, the

suggested materials detailed in the IPM program are not known to be bio-accumulators, or to have a sufficiently rapid degrading half-life or toxicity that would pose a threat as an environmental accumulator.

Additionally, potentially significant impacts during temporary construction activity in the timber harvest phase are mitigated to less-than-significant levels through the implementation of best management practices (BMPs) as outlined in the Timber Harvest Plan (Appendix H), such as THP Mitigation #11 (THP Page 61) intended to eliminate construction related pollutants from leaving the construction site.

Response 7: Water Quality Impacts to Municipal Suppliers

Summary of Comments

Several commenters expressed concerns about potentially adverse impacts to water quality within the Bell Canyon Reservoir watershed and the Friesen Lakes adjacent to and uphill from the project site. Specifically, commenters note that Bell Canyon Reservoir supplies drinking water to the City of St. Helena, while the Friesen Lakes supply drinking water to the town of Angwin.

Response

Municipal Suppliers

Two municipal water suppliers draw their supply from water sources in the geographic vicinity of the Proposed Project. Bell Canyon Reservoir supplies drinking water to the City of St. Helena, while the Friesen Lakes supply drinking water to the town of Angwin. This is disclosed in Sections 2.2.1, Section 3.2, and Section 4.9 of the Draft EIR, and has been further clarified in the Final EIR.

Howell Mountain Mutual Water Company

To the south and east of the property, there are a number of storage ponds and diversion ditches operated by the Howell Mountain Mutual Water Company, which supply drinking water to approximately 400 residences in the town of Angwin. Collectively, these reservoirs are known as the Friesen Lakes. The reservoir on-site known as “No Name Lake” is part of this system, as well as one diversion ditch mapped on the property, beginning just below the reservoir on the eastern edge of parcel APN 018-060-013; this ditch does not convey water in typical conditions and, like the lake, is outside of the project site. Specifically, No Name Lake is at an elevation of 2,125 feet above mean sea level (amsl), and as shown on the topographic map included as Figure 3-2 of the Draft EIR, a USGS blueline stream at approximately 2,110 feet amsl separates the reservoir from Block D. Therefore, there is no direct hydrologic connection between this reservoir within the Friesen Lake system and the project site. The

existing reservoir and ditch will be unaffected by the Proposed Project, as both are located upstream of the proposed vineyard blocks and outside of the area of impact.

City of St. Helena: Bell Canyon Reservoir

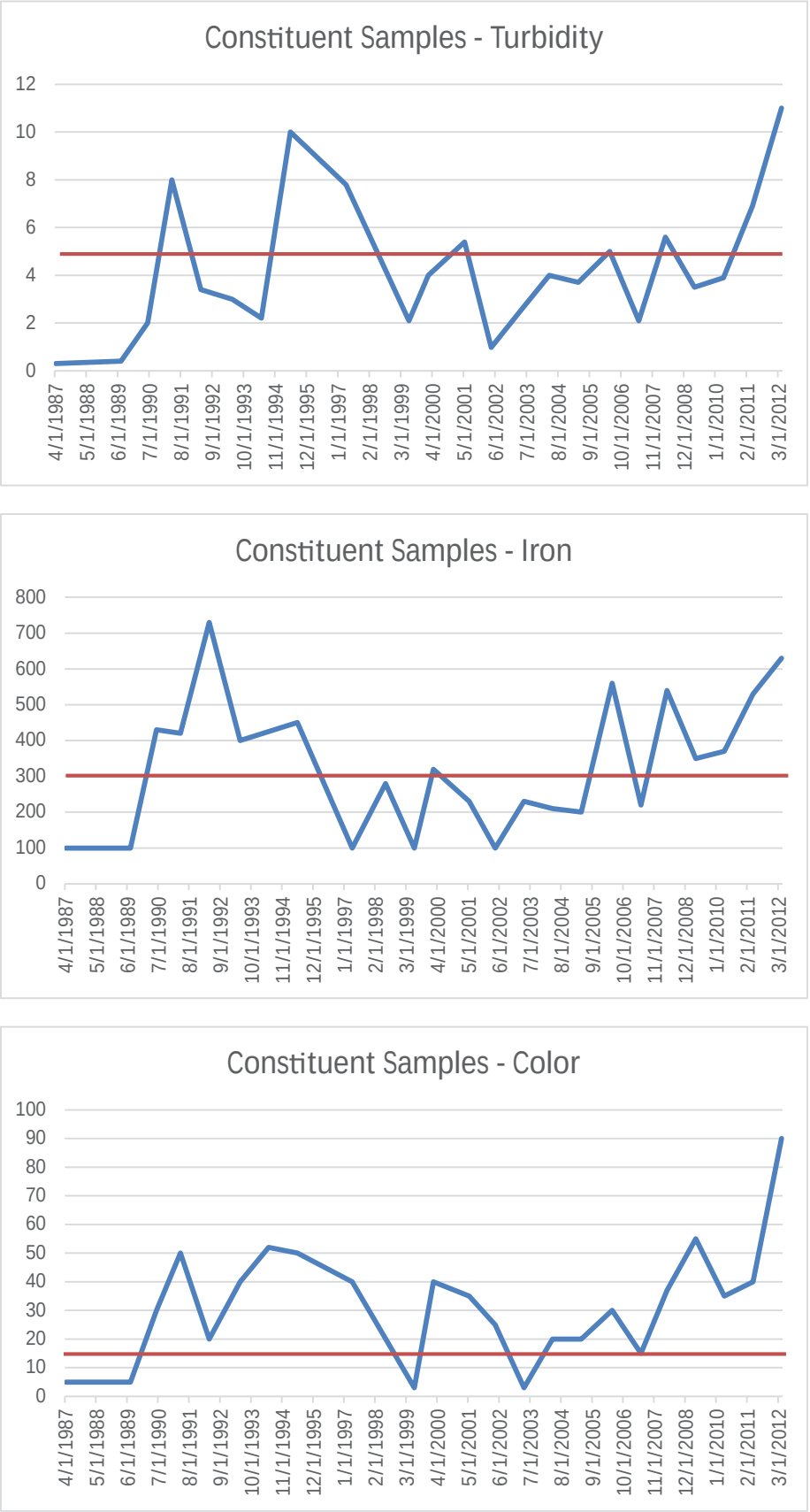
As discussed in Section 4.9.1-2 (page 4.9-22) of the Draft EIR, the project site lies within the Bell Canyon watershed, a subbasin that drains to Bell Canyon Reservoir. Canon Creek is the main tributary to Bell Creek, which enters the Bell Canyon Reservoir; Bell Creek flows approximately 1.7 miles from the base of the dam forming the reservoir to its confluence with the Napa River (NCRCD, 2005). The two existing USGS blueline streams and one existing Class III drainage on the property convey water within the Bell Canyon watershed, which eventually reaches the Bell Canyon Reservoir.

Water quality data from the State Water Resources Control Board (SWRCB), Division of Drinking Water was obtained for the Bell Canyon Reservoir. This data (included as **Appendix P** to this Final EIR), indicates that water quality is generally good for the watershed, with only three constituents (iron, color, and turbidity) exceeding the Maximum Contaminant Level (MCL) for drinking water as set by the U.S. Environmental Protection Agency (USEPA). Data from 1989 indicates that agricultural pesticides such as chlordane and lindane at one point were constituents of concern in the watershed; however, after USEPA regulation of these chemicals and Napa County BMPs for vineyards, they are no longer found in the water supply. As shown on **Figure 3-1**, color, turbidity, and iron are the only three constituents that are consistently identified in water quality samples in the Bell Canyon Reservoir.

According to a USEPA document on water quality parameters (USEPA, 1986), objections to high color are generally on aesthetic grounds rather than on the basis of a health hazard. Natural color reflects the presence of complex organic molecules from matter such as leaves and branches. Meanwhile, iron is present in significant amounts in soils and rocks and thus often present in water passing through. There are normally no harmful effects to drinking water with significant amounts of iron. Rather, iron also contributes to effects on aesthetics resulting in added color and turbidity. It should be noted that with implementation of the Proposed Project's ECP, factors such as turbidity (and hence color) from the project site will be reduced from existing conditions. Additionally, the Proposed Project would not affect iron levels in associated waterways as it is not a proposed soil additive and this is a natural component of rocks and minerals that would be unaffected by the Proposed Project.

Regulatory Compliance

The Napa County General Plan (General Plan) and Napa County municipal code contain goals and policies related to water resources, hydrology, and water quality as defined on pages 4.9-10 to 4.9-14 of the Draft EIR. Impact 4.9-5 of the Draft EIR acknowledges that the Bell Canyon



SOURCE: AES 12/4/2015

Figure 3-1
Bell Canyon Reservoir Constituents of Concern

watershed is a County-designated sensitive domestic supply watershed. As such, the Proposed Project would retain 62.1 percent of tree canopy and 57.0 percent brush on the property which conforms to Napa County Code Section 18.108.027 and General Plan Policy CON-18 requiring sensitive domestic water supply drainages to retain between 40 and 60 percent of existing vegetation as compared to 1993 conditions. This policy, applicable only to sensitive domestic water supply drainages, it intended to protect the water quality and vegetative state of watersheds supplying drinking water in the County. In addition, General Plan Policy CON-48 requires erosion control plans that limit a project's impact to pre-development sediment erosion conditions while Policy CON-50 discusses the use of buffers and stream setbacks.

The Proposed Project is in compliance with these policies and ordinances through its design and mitigation measures. All project activities are set back from the on-site USGS blue line streams and Class III water course by buffer zones ranging from 55 to 125 feet, consistent with Napa County ordinance and Forest Practice Rules, and no activities would take place within these setbacks. The USEPA's *State Methods for Delineating Source Water Protection Areas for Surface Water Supplied Sources of Drinking Water* document describes setbacks and buffer zones as "important methods" to protect water sources. According to the document, "Surface water setbacks and buffer zones are often used as a means of reducing the adverse impacts of runoff on drinking water sources. Setback/buffer zones filter out some portion of sediment-borne contaminants. In addition, by slowing down overland-flow velocity, these green areas briefly increase the exposure of overland-flow to such processes as photolysis and encourage an increase in infiltration to the ground water reservoir." Refer to **General Response 5** for more information on sediment control and policy compliance, including the methods in which the Proposed Project will decrease the amount of sedimentation from pre-development conditions.

General Plan Goal CON-8 seeks to reduce chemical contaminants. The Proposed Project will be operated using IPM techniques that focus on environmentally sensitive methods of reducing agricultural pests and avoids the use of harsh chemicals, as discussed in Appendix J of the Draft EIR and **General Response 6**, above. Additionally, per THP Mitigation #11 (THP Page 61) and Mitigation Measure 4.8-3 (THP Mitigation #11), fuel loading and chemical mixing areas shall be established outside the proposed setbacks and away from any areas that could potentially drain off-site or potentially affect surface and groundwater quality. When equipment is cleaned on-site, only rinse water that is free of gasoline residues, pesticides and other chemicals, and waste oils should be allowed to diffuse back into vineyard areas. In the event pesticides, herbicides or fungicides are used, all rinse water from equipment used to apply chemicals should be collected and stored in containers that are of sufficient size to contain the water until a hazardous materials transporter can remove the rinse water. No rinse water shall be drained to a septic system or discharged to ground or surface water to prevent the release of hazardous materials into the environment during operation and maintenance of the proposed

project. Mitigation Measure 4.8-2 (THP Mitigation #10) on page 4.8-11 of the Draft EIR also addresses proper handling and application in the case of chemical use.

Summary

As discussed above, the existing No Name Lake will be unaffected by the Proposed Project, as it is located at a higher elevation from the proposed vineyard blocks and outside of the area of impact. Therefore, there is no direct hydrologic connection between this reservoir within the Friesen Lake system and the project site.

As for the Bell Canyon Reservoir, the Proposed Project is in compliance with all County ordinances that were specifically designed to protect sensitive domestic water supply drainages and the associated municipal water supply. According to the City of St. Helena's 2012 Consumer Confidence Report, the "Bell Canyon watershed is small and contains few potential contaminant sources. The land immediately surrounding the reservoir is owned by the City and is thoroughly protected. The most significant sources of contaminants in the watershed are wildfires and development of vineyards. Enlighted vineyard development and erosion control practices continue to have a positive influence on reducing the potential for adverse water quality impacts." Thus, as acknowledged by the Draft EIR in Impact 4.9-2 and according to the City of St. Helena's documentation, the ECP and mitigation measures are designed to reduce negative impacts on water quality.

Response 8: Groundwater Use and Water Availability

Summary of Comments

Some commenters expressed concern regarding groundwater availability and use. Commenters specifically noted California's recent drought conditions in regards to the Proposed Project's water use.

Response

It is important to clarify that the Napa-Sonoma Valley groundwater basin and the North Napa Valley Basin are located in the alluvial valley floor of Napa Valley. The property is located in the eastern hills above the valley, and is not located in either of these groundwater basins.

There are two existing wells on the property. Well No. 1 is located approximately 50 feet south of the existing reservoir and would not be used as a water source for the Proposed Project. Well No. 2 is located is located in Block C and is proposed as the primary source of irrigation water for the proposed vineyard. Well No. 2 is capable of sustaining a yield of approximately 50 gallons per minute (gpm), as discussed on page 3-13 of the Draft EIR. The well is supported by groundwater located in the fractured Sonoma Volcanics underlying the project site; the well is sufficiently deep (there is a 23 foot concrete sleeve below ground level and perforations begin

280 feet below ground surface) and set back from any surface water features to avoid pumping any surface or subsurface flow.

As discussed in-depth in Section 4.9.1-1 of the Draft EIR, the property receives approximately 125 acre-feet (af) of rainfall (37.43 acre property multiplied by the average precipitation of 40 inches) per year. This average precipitation is the long-term average from 1940 to 2015, as measured at the Angwin Pacific Union College National Oceanic and Atmospheric Administration Cooperative Station (coop station) 3 miles southeast of the project site. It is important to note that historic droughts in California (DWR, 2015) include the following years:

- WY 1928-29 through WY1933-34 – six years
- WY 1975-76 through WY 1976-77 – two years
- WY 1986-87 through WY 1991-92 – six years
- WY 2006-07 through WY 2008-09 – three years
- Current drought – WY 2011-12 through WY 2014-15 – four years to date

Therefore, the 1940 to 2015 precipitation data measured at the Angwin Pacific Union College coop station includes four of California's most notable droughts and still averages 40 inches per year.

The Water Availability Analysis (WAA) prepared by NVVE and included as Appendix N to the Draft EIR utilized a conservative estimate of 10 percent recharge to Sonoma Volcanics, and found that the property contributes approximately 12.5 af of groundwater recharge annually (NVVE, 2014; Appendix N). Given that the long term groundwater use of the proposed vineyard is approximately 3± af per annum (afa) as calculated in Appendix N of the Draft EIR, the property's potential recharge capacity of 12.5 afa far exceeds the amount of groundwater that would be extracted by the existing well for long-term vineyard irrigation.

As noted by several commenters, short-term irrigation demands of the new vineyard is greater during the establishment period of the vines. This is discussed in 4.9.1-4 of the Draft EIR. As stated therein, the vineyard requires approximately 6 af of water per year during the establishment period, which represents 30 percent of the parcel's allowable groundwater limit and is still less than the recharge rate from annual precipitation on the property.

Napa County Code Section 13.15 regulates, to the maximum extent possible, "the extraction and use of groundwater resources in Napa County" in order to "prohibit extraction for wasteful, unreasonable or non-beneficial purposes" and to "promote groundwater conservation." The County implements this ordinance through discretionary approval of a groundwater permit for new development projects. Groundwater permits are evaluated through the WAA process, which must demonstrate that sufficient water is available for use. Napa County recently

updated its WAA process to account for new legislative actions, scientific understanding of the local aquifers, and BMPs for groundwater sustainability. The Proposed Project is in compliance with the Napa County WAA process and shall obtain all required permits for groundwater use prior to vineyard development.

Research has shown, using climate data from 1999 to 2011, that oak tree canopy coverage of 40 to 60 percent results in annual groundwater extraction equivalent to that of an established irrigated vineyard (Grismer and Asato, 2012). Grismer and Asato go on to state that:

> "Grapevines are fairly drought tolerant and can be managed with deficit irrigation to obtain the levels of sugars, tannins and acids desired by the winemaker. For premium wine grape production, the plants are often water stressed in late summer or fall to reach desirable grape sugar and tannin levels, with less consideration of yield. Following grape harvest, the vines are largely dormant, and winter rains effectively leach soils and replenish water available in the root zone for bud break in the late spring."

As discussed in Impact 4.9-4 of the Draft EIR, the Proposed Project would not result in any long-term impacts to local or regional groundwater supplies because the Proposed Project would comply with Napa County Groundwater Conservation ordinances, would pump less groundwater than what recharges annually on the property, and a key study shows that vineyards utilize equivalent levels of groundwater as compared to woodlands.

Sustainable Groundwater Management Act

The Sustainable Groundwater Management Act (SGMA; Water Code § 10720 et seq.) was enacted to provide for the sustainable management of groundwater basins and to enhance local management of groundwater consistent with rights to use or store groundwater. Although Napa County and other local agencies may choose to become a groundwater sustainability agency for the long term regulation and management of the Napa Valley Basin, the fractured granitic rocks underlying the project site would not be subject to regulation under SGMA. Pursuant to Water Code § 10721(b), a "'Basin' means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Chapter 3 (commencing with Section 10722)." Therefore, the Proposed Project will not be affected by future sustainability plans developed for the Napa Valley Basin.

Response 9: Concrete Slab Crossing Use

<u>Summary of Comments</u>

Some commenters expressed concern regarding the use of the existing concrete slab crossing along Friesen Drive as it relates to overall stability and water quality risks.

Response

In response to comments received on the Draft EIR, additional description and discussion of the concrete slab crossing has been added to Section 4.9-3 of this Final EIR. The concrete slab crossing is an approximately 2 foot thick concrete slab that is situated downslope of a privately owned vineyard pond and upslope from a pond owned by the Howell Mountain Mutual Water Company. The crossing is similar to a ford crossing where water flows over and across the slab during high flows and percolates under the slab during low flow conditions. This crossing is located approximately 1.5 miles south of the property, adjacent to existing vineyards and the Howell Mountain Mutual Water Company's water infrastructure.

During the PHI conducted on August 25, 2015, the California Geological Survey (CGS) performed an Engineering Geologic Review of the THP. During this analysis, the length of Friesen Drive was evaluated. As a whole, CGS found Friesen Drive to be in good condition with no erosion sites. According to CGS, the slab is in good condition and does not appear degraded. In a conversation with CGS, the system manager of the Howell Mountain Mutual Water Company stated that trucks routinely traverse the slab without adverse impact. The manager also indicated he has never witnessed water running over the surface of the slab. Under current conditions, Friesen Drive (and therefore the concrete slab crossing) is used by existing vineyard's equipment, Howell Mountain Mutual Water Company, and visitors to the Napa Land Trust's property, with no adverse impacts to water quality or to overall stability.

Construction and ongoing operations of the proposed vineyard would occur during the spring, summer, and fall, when there is unlikely to be flow running over the low-water crossing. Given that there are no stability concerns or water quality impacts anticipated for this crossing, the Proposed Project would not result in an adverse impact due to continuing use of this crossing.

Response 10: Fire Risk and Fire Protection

Summary of Comments

Several commenters expressed concern over potential fire risks created by the Proposed Project and the site location in a fire hazard zone. Additionally, certain commenters questioned the project's burning of slash on the site.

Response

The Draft EIR acknowledges the project site's location in a "Very High Fire Hazard Severity Zone" and inherent associated fire risks throughout Section 4.8. However, as discussed in Impact 4.8-5 of the Draft EIR, vineyard development would not make the property more vulnerable to wildland fires. The removal of trees, brush, and understory over approximately 13.6 acres on the property and subsequent planting of 10.6± acres of vineyard will create a fire break for the surrounding residential land uses, as vineyard is significantly less flammable than

woodlands. In fact, vineyards and olive orchards are considered one of the best fire-resistant crops to provide a fuel break in Mediterranean climates (Keeley et. al, 2012). In addition, the Habitat Retention Area (HRA) required for oak habitat mitigation will have a duel benefit of reducing understory components that are a high fire risk. As discussed in Mitigation Measure 4.4-1 (THP Mitigation #15), to enhance the existing habitat and encourage existing oak seedlings to grow into the overstory, understory vegetation will be selectively removed. In addition, some pine will be girdling, which would result in some additional fuel load. In the short-term, the fuel load at the edges of the property may increase slightly. However, in the long-term, the healthier forest habitat created by the HRA enhancement techniques would reduce fuels related to plant succession. The healthier forest, in combination with the planting of the fire-resistant vineyard, would cause an overall decrease in the fire hazard of the vegetation on the property.

Although additional vineyard personnel would visit the property during the ongoing maintenance of the vineyard, pruning and harvesting activities are not considered to be high-risk wildfire activities. Land use changes and crop cover resulting from the Proposed Project will not significantly increase the risk of wildfire.

As explained in Impact 4.3-1 of the Draft EIR, on-site mulching would be the primary method used for the removal of vegetated material; however, in the event that burning is required of cleared vegetation, it would occur during the wet season (October 30 to April 1) as permitted by governing agencies and in accordance with the Bay Area Air Quality Management District (BAAQMD) Regulation 5, subsection 5-401.2 (BAAQMD, 2008).

Response 11: Western Pond Turtle

Summary of Comments

Several commenters expressed concern regarding the adequacy of mitigation measures to protect western pond turtles within the project site. Additionally, commenters noted that the western pond turtle is currently under consideration for endangered species status by the U.S. Fish and Wildlife Service (USFWS).

Response

The on-site reservoir (No Name Lake) where western pond turtle (*Emys marmorata*) was observed is outside of the proposed development, and, as discussed in **Response 7**, is not hydrologically connected to the project site. A buffer zone of 150 feet separates Block D from this reservoir. According to Kjeldsen Biological Consulting (Appendix D):

> "The Western Pond Turtle is secure within this site. There is available upland estivation habitat surrounding the reservoir…The project site is down slope from the reservoir and

> separated by Friesen Drive…The soils down slope are dry and associated with chaparral, which are not the preferred sandy soils essential for nesting."

Though nesting has been reported to occur up to 1,391 feet (402 meters) from water (Jennings and Hayes, 1994), nesting usually occurs closer, averaging 92 feet (28 meters) from aquatic habitat (Rathbun et. al. 2002), which is discussed in Section 4.4.5-2 of the Draft EIR. Nesting (i.e. oviposition) and basking habitat (important for egg maturation) are crucial to self-sustaining population. As such, loss of emergent wetland vegetation to trampling or construction makes the habitat less suitable for hatchlings and juveniles. The western pond turtle is a habitat generalist and will traverse terrain until suitable habitat for nesting and overwintering is reached. Given that suitable habitat is directly adjacent to No Name Lake, it is highly unlikely that any western pond turtles would traverse across Friesen Drive to enter the project site, which does not contain appropriate soils for estivation. This discussion regarding the lack of suitable habitat within the vineyard blocks has been added to Impact 4.4-7 of this Final EIR. Although the impacts to western pond turtle are less than significant, additional mitigation has been added to this Final EIR requiring orange construction fencing to be place along the east side of Friesen Drive to ensure that construction equipment or workers do not disturb western pond turtle habitat. The Proposed Project will have no significant impact on the streams or reservoirs on-site; see **General Response 7** regarding project design and mitigation measure to protect various water sources on the property. Additionally, the ECP requires that turtle friendly cattle guards would be installed. These guards have turtle escape openings ten inches wide by six inches high.

The western pond turtle is currently listed as a species of special concern (SSC) in the State of California. Per the California Department of Fish and Wildlife (CDFW) (Comrack et al., 2008):

> "SSCs should be considered during the environmental review process. The California Environmental Quality Act (CEQA; California Public Resources Code §§ 21000-21177) requires State agencies, local governments, and special districts to evaluate and disclose impacts from "projects" in the State. Section 15380 of the CEQA Guidelines clearly indicates that species of special concern should be included in an analysis of project impacts if they can be shown to meet the criteria of sensitivity outlined therein."

The Draft EIR is in compliance with CEQA and CDFW's recommendations, as the western pond turtle has been considered in the Draft EIR (Impact 4.4-7). As noted by CDFW, impacts to SSC are considered significant when there are population-level effects, large proportion of the taxon's range may be affected by a project, there are regional effects, or impacts to a habitat feature. The Proposed Project would not impact No Name Lake, would not remove or block access to prime upland or nesting habitat, and would not have regional-level effects to the

species. Therefore, the Draft EIR appropriately concluded that this is a less-than-significant impact.

Additionally, the western pond turtle is currently under review by the USFWS for listing as threatened or endangered under the Federal Endangered Species Act (FESA) (USFWS, 2015); however, it is not yet considered a candidate species. Pursuant to FESA, until such a time that the western pond turtle does become listed, no additional legal protections are afforded by FESA to this species (USFWS, 2014). However, western pond turtle is adequately protected by the CDFW's SSC status, which ensures that the species must be considered by projects requiring discretionary approval.

Response 12: Habitat Retention Area

Summary of Comments

Several commenters expressed concern over both the successful establishment of the HRA as well as its protection in perpetuity on the property.

Response

To offset the removal of oak woodlands as part of the THP, the HRA shall be created on the property to protect oak woodlands via two mechanisms: retention and enhancement. Mitigation for the 5.32 acres of oak woodland impacted by the project at a 2:1 ratio would necessitate 10.6± acres of high value woodland habitat be enhanced and maintained within the property. The intent of the HRA is to increase the quality and quantity of oak woodland habitat, develop forest resources, improve water quality, and sequester carbon. With implementation of Mitigation Measure 4.4-1 (THP Mitigation #15) in the Draft EIR, explained above, impacts to oak woodlands would be reduced to less-than-significant levels in accordance with CEQA *Guidelines* § 15126.4. The HRA would contain 13.1 acres, which exceeds the 2:1 ratio of mitigated versus impacted oaks required by the Napa County General Plan Policy CON 24. Pursuant to the Oak Woodlands Conservation Act (Section 21083.4 of the Public Resources Code), Napa County protects against the conversion of oak woodlands that will have a significant effect on the environment by implementation of General Plan Policies CON 24, CON-28, and CON-29. Establishment of this HRA is in compliance with all local and State policies and regulations.

As described in Mitigation Measure 4.4-1 (THP Mitigation #15), the HRA has been designed to avoid areas identified as high value oak woodlands that occur along riparian corridors and ensure they are retained in their natural state. To enhance additional areas outside of the project footprint, the HRA proposes to reduce competition for the oaks in the understory by removing competition associated with the non-oak trees in the overstory. This will entail girdling California foothill pine (*Pinus sabiniana*) and/or chaparral [chamise (*Adenostoma fasciculatum*),

manzanita (*Arctostaphylos* ssp.), etc.]. Reducing the overstory competition will allow the existing oak seedlings to grow; using naturally-established oaks rather than replanting will also ensure higher success rates of mature oaks. A significant portion of the area slated for enhancement, particularly to the north and east of No Name Lake, were identified in 1993 aerial photography as oak woodland; in these areas, the enhancement activities will restore habitat that has been impacted by ongoing competition from the pine and chaparral habitat. At a minimum, a total of 9.6 acres of Oak Enhancement Areas, as identified on Figure 4.4-4 in the Draft EIR, shall receive the treatment described above. It is important to note that in an effort to prevent additional damage to the existing vegetation in the HRA, no mechanical equipment will be allowed within the HRA, except on the existing Friesen Drive.

The Draft EIR acknowledges that long-term preservation of the HRA is imperative to ensure that the mitigation is a successful and binding measure to mitigate for project impacts in accordance with CEQA *Guidelines* § 15126.4. A discussion is provided of Section 18.108.027 of the Napa County Code, which limits development on the property so that it maintains at least 60 percent of the tree canopy and 40 percent of the shrub canopy, as compared with 1993 aerial photography. Therefore, each property has a limited acreage that can be developed per Napa County Ordinance 1219, providing a *de facto* conservation easement for the remainder of the property. Now that the Proposed Project has reached the 60/40 ratio of vegetation retention as mandated by local law, additional vegetation removal is not permitted on the property. Therefore, there is a legally binding protective mechanism on the property ensuring that the HRA will be maintained in perpetuity.

Due to comments received on the Draft EIR expressing concern regarding long-term effectiveness of the HRA enhancement techniques, Mitigation Measure 4.4-1 (THP Mitigation #15) has been revised in this Final EIR to require annual monitoring after development of the project for a minimum of 5 years to ensure that the HRA is successful.

Response 13: Napa Lomatium Mitigation

Summary of Comments

A commenter expressed concerns over the seed bank retention strategy proposed to mitigate impacts to Napa lomatium (*Lomatium repostum*).

Response

Kjeldsen Biological Consulting found that Napa lomatium (*Lomatium repostum*) is present in three populations along an access road in the open and disturbed areas within the manzanita chaparral alliance. This plant is listed by the California Native Plant Society (CNPS) as a California Rare Plant Rank (CRPR) 4.3 species, and is common in disturbed areas of chaparral communities. This is a seral species that appears after clearing and then is out-competed over

time as the shrub overstory canopy develops and leaf litter accumulates. Several populations were found within the footprint of Block D. Kjeldsen Biological Consulting stated that there is no need to avoid this species and they "anticipate removal of overstory will allow growth of this species around the edges of the vineyard blocks." However, during the scoping period, the County suggested that a seed retention plan be implemented (Appendix A of the Draft EIR). Given that the Proposed Project would have an adverse impact on at least a portion of identified Napa lomatium areas and corresponding seed bank, a seed retention plan is required in Mitigation Measure 4.4-3 (THP Mitigation #20) to ensure that impacts to Napa lomatium are less than significant. Mitigation Measure 4.4-3 (THP Mitigation #20) specifically requires that topsoil from the populations within the clearing limits be skimmed under the supervision of a qualified biologist or botanist and transplanted to the 150-foot buffer zone surrounding the pond in an area that is ecologically suitable for the species, again under the supervision of a qualified biologist or botanist.

After consideration of comments received on the Draft EIR, Mitigation Measure 4.4-3 (THP Mitigation #20) has been revised to include monitoring by a qualified botanist or biologist after removal of the seed bank to ensure that the mitigation strategy is effective. This monitoring will likely occur during the same annual period as the HRA monitoring discussed in **Response 12**, above.

Response 14: Habitat Fragmentation and Wildlife Corridors

Summary of Comments

Several commenters expressed concerns regarding impacts to wildlife movement corridors resulting from the Proposed Project, as well as overall habitat fragmentation. Several commenters assert that the Proposed Project fails to cluster development and is therefore causing habitat fragmentation.

Response

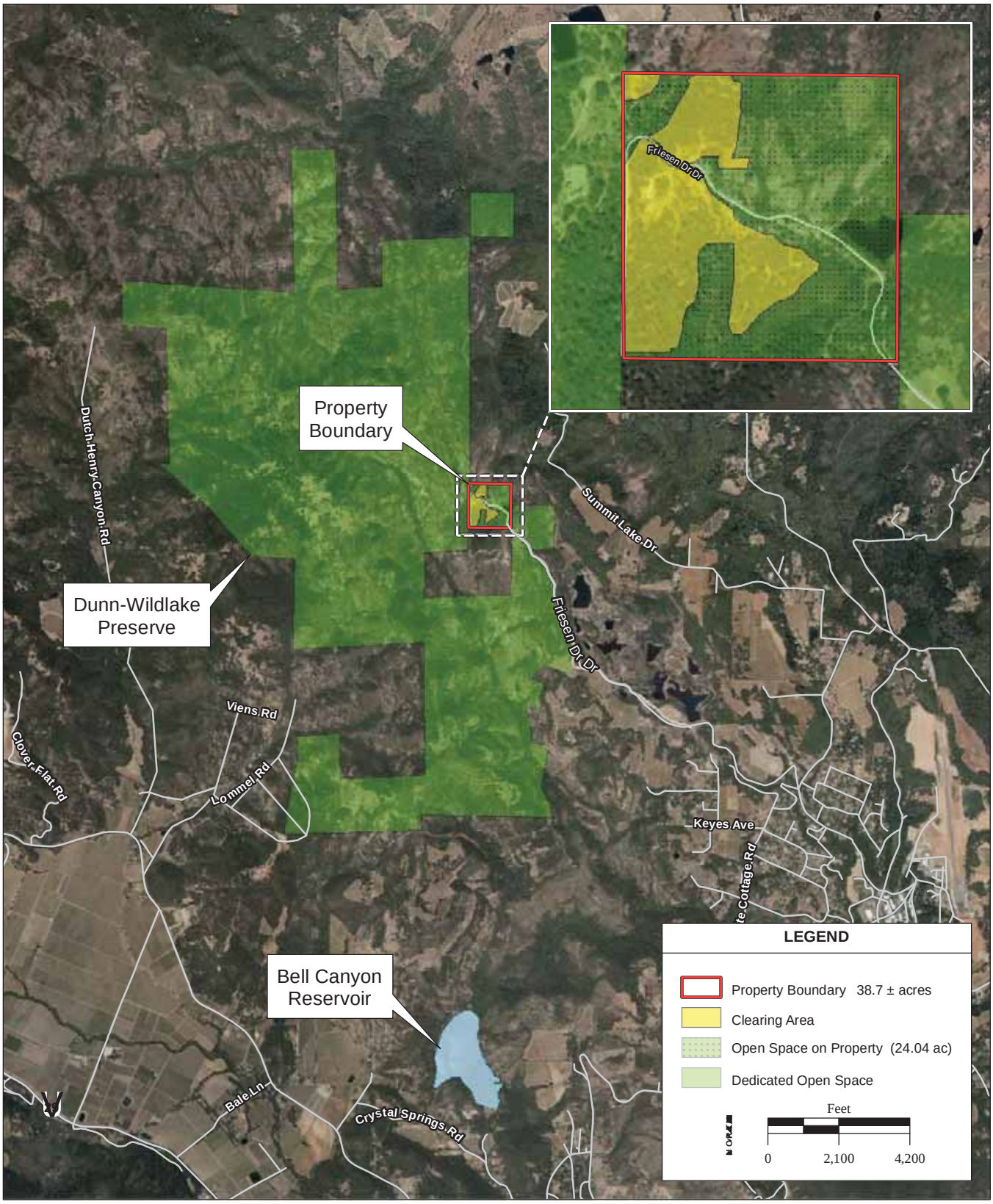
The project site is surrounded by open space land (including the Dunn-Wildlake Preserve), and is therefore a site of clustered development within the larger region. As shown in the aerial photo in Figure 4.1-1 of the Draft EIR, there is no development to the west of the property that would hinder wildlife movement. The closest development to the east in Pope Valley is separated from the project site by several undeveloped hills that all provide sufficient open space for wildlife movement. Therefore, there is no cumulative development that would prevent wildlife movement in the region. Concentrating all vineyard development in one section of the property is infeasible. Proposed vineyard blocks have been chosen based on multiple factors, including soils, topography, and farmability. Areas that are suitable for vineyards are not located in one particular area; rather, such areas are located at various sites across the property. The Proposed Project focuses on those areas that are considered suitable vineyard

areas. Additionally, the vineyard blocks as proposed are located in areas that can be developed with minimal environmental effects, including impacts to biological resources, erosion, and slope stability, while maintaining stream setbacks to protect water quality. Mitigation measures presented in the EIR will further reduce these environmental impacts in accordance with CEQA. While consolidating vineyard development in one section of the property may increase the size of wildlife corridors, an impact that was already found to be less than significant in Impact 4.4-9, it would likely increase other environmental impacts due to placement of vineyard blocks in sensitive plant habitat or within stream setback areas.

In addition, Mitigation Measure 4.4-1 (THP Mitigation #15) which creates the HRA and long-term habitat retention and enhancement on the property will minimize impacts to wildlife corridors and habitat connectivity on the property with the protected habitats in the greater vicinity. In its existing state, the property contains fragmented habitat that has been altered by humans (road construction, reservoir construction, etc.) and natural causes (predominantly fire). The HRA shown in Figure 4.4-3 of the Draft EIR connects with existing open space in the vicinity, including the Napa County Land Trust property to the west, east, and south. In response to comments received on the Draft EIR, **Figure 3-2** has been prepared to show a zoomed out view of the HRA in relation to the existing open space surrounding it. Therefore, the HRA will improve wildlife corridors and minimize habitat fragmentation within the overall context of the site and vicinity. Finally, the property is surrounded by extensive open habitat and approximately 64 percent of the property will be retained as wildlife habitat, watershed, and open space.

Additionally, site surveys conducted by biologists assessed the project site for its baseline condition as a wildlife corridor. Aerial photos were reviewed to assess the habitat surrounding the site and the potential for wildlife movement, or wildlife corridors from adjoining properties onto or through the property. Field surveys were conducted to identify corridors for movement, game trails, or habitat which would favor movement of wildlife or potential gene flow. Biologists also looked for barriers which would prevent movement or direct movement to particular areas (Kjeldsen, 2015). The property is surrounded by adjacent woodlands; however, biological surveys of the property confirmed that while some game trails are present, there are no identifiable significant wildlife corridors associated with the property (Kjeldsen, 2015).

The property has not been identified as part of a major regional movement corridor (NCCDPD, 2011). This is discussed in Section 4.4.4-4 and Impact 4.4-9 of the Draft EIR. It should be noted that in its existing baseline condition, much of the property line is surrounded by a barbed wire fence installed by a previous property which currently impedes wildlife movement.



SOURCE: Napa County aerial photograph, 6/5/2014; ESRI Data, 2013; AES, 2/8/2016

Figure 3-2
Regional Open Space

The ECP contains wildlife exclusion fencing measures, which would involve the installation of exclusionary fencing around only the designated vineyard blocks. The fencing would include exit doors (gates) and/or turtle friendly cattle guards located as shown in the ECP (Appendix B).

Vineyard blocks will be individually fenced rather than fenced as a larger group, which will facilitate wildlife movement within and through the property. The wildlife exclusion fencing would be 6 feet tall with 8-inch by 8-inch square mesh with two strands of barbed wire (total eight foot height). Many of the negative effects of habitat fragmentation will be negligible within the project site because the vineyard fences will be highly permeable to most small animals and the vineyards themselves are not a barrier to the movement of most animal species. The unfenced areas would provide wildlife movement corridors for all wildlife, including larger animals restricted by deer fencing (deer, wild pig, coyote, mountain lion, and bobcat).

The stream corridors and buffers between the proposed vineyard blocks allow significant wildlife movement between contiguous habitats within the property and adjacent undeveloped land. Movement areas in general have been preserved throughout the project site consistent with the stream setbacks prescribed pursuant to Section 18.108.025 of the Napa County Code; required stream setbacks within the project site range from 55 feet to 125 feet on either side of the streams (measured from top to bank). Therefore, corridors around streams are a minimum of 110 feet wide. Scientific studies indicate that vegetated riparian corridors of widths greater than 30 meters (98 feet) are most likely to be used by wildlife (Hilty and Merenlender, 2002). In regards to corridor use for large mammals, including predators, studies have shown that rather than depending solely on maneuvering through vineyard itself, predators are more likely to utilize natural core habitats when functional riparian corridors are maintained, as discussed above. Thus, the project site location, project design, and ECP measures for setbacks will be effective for wildlife movement through the property.

There is no conflict with the Napa County General Plan policies concerning wildlife corridors and there is a less-than-significant impact to wildlife movement in accordance with CEQA *Guidelines* Appendix G Environmental Checklist.

Response 15: Wildlife Displacement

Summary of Comments

Some comments expressed concern that the development of vineyards on the project site would drive wildlife towards residential properties due to project operations and habitat fragmentation.

Response

As discussed in **General Response 14** and Impact 4.4-9 of the Draft EIR, wildlife exclusion fencing is proposed to be installed to encompass only the vineyard blocks with exit doors (gates) and/or cattle guards located as shown in the ECP (Appendix B) for safe removal of trapped wildlife. Vineyards themselves do not constitute barriers to wildlife movement, but deer fencing around them do present barriers to movement of larger animals. However, the unfenced corridors between the proposed vineyard blocks could be easily traversed by large species such as coyote, bobcat, mountain lion, and deer, which would allow large species the ability to utilize the existing open space surrounding the property. Given the property's location adjacent to the Napa Land Trust's 3,030 acre Dunn-Wildlake Preserve, there will be more than sufficient habitat left in the local area to accommodate wildlife such that the 13.6± acre development on the 40-acre property (with the balance remaining as open space surrounded by other open space) will not result in a significant impact due to wildlife displacement.

Response 16: Climate Change

Summary of Comments

Several commenters expressed concerns regarding the methodology used to calculate greenhouse gas (GHG) emissions generated by the Proposed Project and the mitigation to offset GHG emissions. Several commenters directly included the Quercus Group's letter or incorporated it by reference.

Response

The analysis presented in Section 4.7 of the Draft EIR was conducted in accordance with CEQA *Guidelines* § 15064.4 for determining the significance of impacts from GHG emissions. The Draft EIR modeled the projected increases in GHG emissions from construction and operation of the Proposed Project using the California Air Resources Board (CARB)-approved CalEEMod, which is consistent with CEQA *Guidelines* § 15064.4(a)(1). The CalEEMod model output files are provided in Appendix C and consolidated emissions information compared to appropriate significance thresholds is provided in Table 4.7-1 and Table 4.7-2 of the Draft EIR. These significance thresholds were determined by the Lead Agency in accordance with CEQA *Guidelines* § 15064.4(b)(2).

Direct and indirect biogenic GHG emissions occur when forest resources are harvested; refer to page 4.7-6 of the Draft EIR for additional discussion. The BAAQMD CEQA Guidelines require the quantification of direct biomass carbon emission, as shown in Table 4.7-1 (as "timber removal"); however, the BAAQMD CEQA Guidelines do not recommend the inclusion of indirect biogenic emissions. As discussed in Section 4.7.3-1:

> "Although the Guidelines provide clear guidance on how to analyze GHG emissions from biogenic sources, which result from natural biological processes such as the decomposition or combustion of vegetative matter (wood, paper, vegetable oils, animal fat, yard waste, etc.), the Guidelines do not require the quantification of biogenic emissions as part of the quantification of GHG emissions for projects and does not provide a GHG emission threshold for these sources for both operation and construction activities. However, the Guidelines do recommend that construction-related GHG emissions be quantified using the CalEEMod 2013.2 air quality program California Emissions Estimator Model (CalEEMod) and disclosed in the appropriate environmental document. The Guidelines require that only exhaust from construction equipment be included in the climate change analysis, similar to the analysis for criteria pollutants."

The construction of the Proposed Project would generate 3,032 MT per year of carbon dioxide equivalent (CO_2e), much of this due to timber removal. However, retention of some timber as lumber reduce the total GHG emissions to 1,181 MT/yr of CO_2e, as discussed in Impact 4.7-1. This reduction in GHG emissions of 61 percent ensures compliance with local climate action plans and the State of California's 32 percent reduction goals established by Assembly Bill (AB) 32. Although the construction emissions were significantly reduced, additional mitigation was provided in Mitigation Measure 4.7-1 (THP Mitigation #21) to ensure that machine idling times are minimized and other measures are required to reduce the needless generation of GHGs. As discussed in Impact 4.7-2 of the Draft EIR, the Proposed Project would generate 92 MT per year of CO_2e, which is significantly less than the BAAQMD operational threshold of 1,100 MT per year of CO_2e.

Responses to the Quercus Group's letter can be found in **Letter A10**, below.

Response 17: Air Quality

Summary of Comments

Commenters expressed concern regarding how air quality is expected to be impacted by the burning of slash on the project site.

Response

As stated in Impact 4.3-1 of the Draft EIR, on-site mulching would be the primary method used for the removal of vegetated material. However, some burning may be required to remove excess vegetation. As discussed in Section 4.3 of the Draft EIR, slash would only be burned in accordance with the BAAQMD Regulation 5, which limits the time of year and conditions for which agricultural burning may occur (refer to **General Response 10** for additional details). This was included in the project description and the air quality analysis, which utilized CalEEMod, and found that impacts would be less than significant with mitigation.

Response 18: General Plan Consistency

Summary of Comments

Several commenters stated that the Proposed Project would not be consistent with the Napa County General Plan, nor with the existing zoning of the property as AW.

Response

Napa County General Plan Goal CON-1 states that the "County of Napa will conserve resources by determining the most appropriate use of land, matching land uses and activities to the land's natural suitability, and minimizing conflicts with the natural environment and the agriculture it supports." The County determined the appropriate land use in the designation of land use and zoning in its general plan process, and determined at that time that the project site was appropriately zoned as "Agricultural Watershed." Land uses allowed include agriculture (and timber harvesting), one single family dwelling per each legal lot, small residential care facilities, antennas, telecommunication facilities, hunting clubs, recreation vehicle parks, campgrounds, and floating docks. Through the Draft EIR, CAL FIRE analyzes the Proposed Project for consistency with local policies and State and federal regulations. Where the Proposed Project is not fully consistent with the goals of the General Plan or regulations, mitigation measures have been provided to address this.

Because the General Plan is an extensive document that covers numerous topics such as traffic and circulation, biological resources, land use, and water quality, relevant General Plan policies are broken up by topic and addressed in the relevant EIR sections by resource type. To consolidate the discussion into one location, **Table 3-1** provides a brief discussion of each relevant General Plan policy and the consistency determination. As shown in **Table 3-1**, mitigation measures have been provided where necessary to ensure that the Proposed Project is consistent with all relevant General Plan policies.

TABLE 3-1: GENERAL PLAN CONSISTENCY

Policy	Policy Summary	Proposed Project Consistent?	Location of Analysis in Draft EIR	Mitigation
Community Character (CC)				
CC-1, CC-5, CC-6, CC-10	County will retain character and natural beauty through preservation of open space (CC-1); vineyards are an accepted visual feature of Napa County but change can cause concern (CC-5); grading of building sites and vineyards shall retain natural landform appearance as much as possible (CC-6); new developments in hillsides shall minimize visibility from County scenic roadways (CC-10).	Yes	Impacts 4.1-1 through 4.1-3; Impact 4.2-1	N/A
CC-7	Accept sounds which are a part of the County's agricultural character while protecting people from excessive exposure.	Yes	Impacts 4.11-1 through 4.11-2	N/A
CC-19, CC-21	The County supports the identification and preservation of resources from the County's historic and prehistoric periods (CC-19); rock walls constructed prior to 1920 shall be retained to the extent feasible (CC-21); supports continued research into and documentation of the county's history and prehistory, and protect significant cultural resources from inadvertent damage during grading, excavation, and construction activities (CC-23); and discourage scavenging of materials from pre-1920s walls and other structures unless they are beyond repair (CC-30).	Yes, with Mitigation	Impacts 4.5-1 through 4.5-3	MM 4.5-1 through MM 4.5-3
CC-35, CC-38	Noises associated with agriculture are considered acceptable and necessary (CC-35). Standards for maximum exterior noise levels are established in the County's Noise Ordinance (CC-38).	Yes	Impacts 4.11-1 through 4.11-2	N/A
CC-49	Ensure reasonable measures are taken such that temporary noise associated with construction does not become intolerable to those in the area. Construction hours shall be limited per requirements of the Noise Ordinance.	Yes	Impact 4.11-1	N/A
Agriculture and Land Use (AG/LU)				
AG/LU-1, AG/LU-3, AG/LU-4	Agriculture is the primary land use in the County (AG/LU-1); planning and zoning shall minimize encroachment of urban uses into agricultural areas (AG/LU-3); designated agricultural lands are reserved for agricultural use (AG/LU-4)	Yes	Impact 4.2-1	N/A
AG/LU-15	The county shall protect the right of agricultural operators in designated agricultural areas to commence and continue their "right to farm" even though there may be complaints against those practices. The existence of this "Right to Farm" shall be indicated on all parcel maps and shall be a required disclosure to buyers of the property	Yes	Section 4.10, Section 4.11	N/A
AG/LU-18	Timber production areas are defined by CAL FIRE mapping (AG/LU-18); County shall encourage active forest management practices to allow for economic and beneficial use of timberland (CON-35).	Yes	Impact 4.2-1	N/A
Conservation (CON)				
CON-1	County will preserve land for greenbelts, forest, recreation, flood control, adequate water supply, air quality improvement, habitat for fish, wildlife and wildlife movement, native vegetation, and natural beauty. The County will encourage management of these areas in ways that promote wildlife habitat renewal, diversification, and protection.	Yes, with Mitigation	Impact 4.2-1, Impact 4.4-1	MM 4.4-1

Policy	Policy Summary	Proposed Project Consistent?	Location of Analysis in Draft EIR	Mitigation
CON-2	Agricultural land will be conserved and improved by: 1) requiring existing significant vegetation be retained and incorporated into agricultural projects to reduce soil erosion and to retain wildlife habitat, 2) minimizing pesticide and herbicide use and encourage use of Integrated pest control methods, and 3) Encourage inter-agency cooperation, recognizing the agricultural commissioner's role as a liaison and the need to monitor and evaluate programs.	Yes, with Mitigation	Impact 4.4-1 through 4.4-3, Impact 4.8-2	MM 4.4-1, MM 4.4-3, MM 4.8-2
CON-5	The County shall identify, improve, and conserve rangeland through encouraging livestock management activities to avoid long-term destruction of rangeland productivity and watershed capacity through overgrazing, erosion, or damage to riparian areas	Yes, with Mitigation	Impact 4.6-1	MM 4.6-1
CON-6	The County shall impose discretionary projects which limit development in environmentally sensitive areas such as those adjacent to rivers or streamside areas and physically hazardous areas.	Yes, with Mitigation	Project Design, Impact 4.4-2, Impact 4.6-2, Impact 4.9-	MM 4.6-2
CON-10	Conserve and improve fisheries and wildlife habitat in cooperation with government agencies, private associations, and individuals.	Yes	Project Design, Impact 4.4-2	N/A
CON-11	Maintain and improve fisheries habitat by: 1) controlling sediment production from mines, roads, agricultural activities; and 2) implement road construction practices to minimize bank failure and sediment delivery.	Yes, with Mitigation	Project Design, Impact 4.4-2, Impact 4.6-1, Impact 4.9-2	MM 4.6-1
CON-13	All discretionary agricultural projects shall consider and address impacts to wildlife habitat and habitat supporting special status species. Where impacts to wildlife and special status species cannot be avoided, mitigation should include: maintain adequate feeding, escape, and nesting habitat; providing protection for habitat through buffering or other means; provide replacement habitat of like quantity and quality on- or off-site; enhance existing habitat values through restoration and replanting; require temporary or permanent buffers to avoid nest abandonment by birds and raptors.	Yes, with Mitigation	Impacts 4.4-3 through 4.4-8	MM 4.4-3 through MM 4.4-6 and MM 4.4-8
CON-14	To offset possible losses of fishery and riparian habitat due to discretionary development projects, developers shall be responsible for mitigation when avoidance of impacts is determined to be infeasible. Such mitigation measures may include providing and permanently maintaining similar quality and quantity habitat within Napa County, enhancing existing riparian habitat, or paying in-kind funds to an approved fishery and riparian habitat improvement fund.	Yes, with Mitigation	Project Design, and Impact 4.4-1	MM 4.4-1 requiring the HRA
CON-16	Discretionary projects require biological resources evaluations prior to earth moving.	Yes	Appendix D	N/A
CON-17	Preserve and protect native grasslands, serpentine grasslands, mixed serpentine chaparral, and other sensitive biotic communities and habitats of limited distribution. Mitigation shall include preventing disturbance or removal; mitigate significant impacts where avoidance is infeasible; promote protection from overgrazing; require no net loss of sensitive biotic communities and habitats of limited distribution through avoidance, restoration, or replacement where feasible. Where avoidance, restoration, or replacement is not feasible, preserve like habitat at a 2:1 ratio or greater within Napa County.	Yes, with Mitigation	Impact 4.4-1	MM 4.4-1 requiring the HRA

Policy	Policy Summary	Proposed Project Consistent?	Location of Analysis in Draft EIR	Mitigation
CON-18	To reduce impacts on habitat connectivity, in sensitive domestic water supply drainages between 40 and 60 percent of the vegetation that existed as of June 16, 1993 shall be maintained; habitat of adequate size, quantity, and configuration shall be maintained to support special status species; discretionary policies shall be required to retain movement corridors of adequate size to allow for continued wildlife use; and new vineyard development shall be designed to minimize the reduction of wildlife movement corridors.	Yes	Project Design	N/A
CON-19	County will use conservation easements as well as vegetation retention and stream setbacks to preserve critical habitat areas and habitat connectivity.	Yes, with Mitigation	Impact 4.4-1, Impact 4.4-9	MM 4.4-1
CON-22	County will encourage protection and enhancement of natural habitats.	Yes, with Mitigation	Impact 4.4-1	MM 4.4-1
CON-24	Maintain and improve oak woodland habitat to provide for slope stabilization, soil protection, species diversity, and wildlife habitat, including by preserving oak trees near the heads of drainages; complying with the Oak Woodlands Preservation Act; providing replacement or preservation of like habitat at a 2:1 ratio; maintaining a mixture of oak species; and encouraging regulations to stop the spread of Sudden Oak Death.	Yes, with Mitigation	Impact 4.4-1	MM 4.4-1
CON-26, CON-27	Natural vegetation along streams shall be retained varying in width with the steepness of terrain.	Yes	Project Design; Impact 4.4-2	N/A
CON-28	Offset additional losses of riparian woodland by maintaining similar quantity and quality of replacement habitat.	Yes	Project Design, Impact 4.4-2	N/A
CON-29	Coordinate with other agencies related to stream setbacks and other BMPs to protect Napa County's natural resources.	Yes	Project Design, Impact 4.4-2	N/A
CON-30	All public and private projects shall avoid impacts to wetlands to the extent feasible.	Yes	Impact 4.4-2	N/A
CON-35	County shall encourage active forest management practices to allow for economic and beneficial use of timberland.	Yes	Impact 4.2-1	N/A
CON-38	The County shall identify, improve, and conserve Napa County's sand and gravel resources, preventing removal of streambed sand and gravel that would cause adverse effects on water quality, fisheries	Yes, with Mitigation	Impact 4.6-1, Impact 4.9-2	MM 4.6-1
CON-41	County will work to protect Napa County's watersheds and public and private water reservoirs to provide: clean drinking water, municipal uses, support of eco-systems, agricultural supply, recreation and open space, and scenic beauty.	Yes, with Mitigation	Impact 4.4-2, Impact 4.9-2, Impact 4.9-5, Impact 4.8-1 through 4.8-3	MM 4.8-1 through MM 4.8-3
CON-42	County will work to improve and maintain the vitality and health of its watersheds by supporting environmentally sustainable agricultural techniques and best management practices (BMPs) that protect surface water and groundwater quality and quantity.	Yes, with Mitigation	Impact 4.8-1 through 4.8-3	MM 4.8-1 through MM 4.8-3
CON-45	Protect the County's domestic supply drainages through vegetation preservation and protective buffers to ensure clean water. Continue implementation of current Conservation Regulations relevant to these areas such as vegetation retention, consultation with water purveyors/system owners and erosion controls.	Yes, with Mitigation	Impact 4.4-2, Impact 4.9-2, Impact 4.9-5, Impact 4.8-1 through 4.8-3	MM 4.8-1 through MM 4.8-3

Policy	Policy Summary	Proposed Project Consistent?	Location of Analysis in Draft EIR	Mitigation
CON-47	County shall comply with applicable Water Quality Control/Basin Plans as amended through the Total Maximum Daily Load. Ensuring effectiveness of the National Pollution Discharge Elimination System and the County's Conservation Regulations	Yes, with Mitigation	Impact 4.6-1, Impact 4.9-2	MM 4.6-1
CON-48	Proposed developments shall implement project specific sediment and erosion control measures that maintain pre-development sediment erosion conditions or at minimum comply with state water quality pollution control requirements and require detailed technical reports. BMPs shall be monitored and tracked in controlling soil erosion within watershed areas and employ corrective actions for water quality issues.	Yes, with Mitigation	Impact 4.6-1, Impact 4.9-2	MM 4.6-1
CON-50	County shall require all construction-related activities to have protective measures in place. County shall ensure fines are levied upon code violators and require remediation.	Yes, with Mitigation	Impact 4.6-1, Impact 4.9-2	MM 4.6-1
CON-52	County encourages responsible use and conservation of groundwater.	Yes	Impact 4.9-4, Appendix N	N/A
CON-53	County shall ensure new development is consistent with capacity of water supplies by requiring all applicants for discretionary projects to demonstrate availability of supply.	Yes	Impact 4.9-4, Appendix N	N/A
Safety (SAF)				
SAF-5	The County shall cooperate with other local jurisdictions to develop intra-county evacuation routes to be used in the event of a disaster within Napa County.	Yes	Impacts 4.8-4 and 4.8-5	N/A
SAF-8	Require a geotechnical study for new projects located near geologic hazard areas and restrict new development atop seismic faults. Geologic studies shall identify site design and structural measures to prevent injury from seismic events.	Yes, with Mitigation	Impact 4.6-2, Appendix G	MM 4.6-2
SAF-9	Planting of native vegetation on unstable slopes shall be incorporated into project designs to minimize the potential for erosion or landslides.	Yes	Project Design (avoiding slopes)	N/A
SAF-10	No extensive grading shall be permitted on slopes over 15 percent where landslides or other geologic hazards are present unless the hazard(s) are eliminated or reduced to safe levels.	Yes, with Mitigation	Impact 4.6-2, Appendix G	MM 4.6-2
SAF-30, SAF-31	Potential hazards resulting from the release of liquids from the possible rupture of aboveground tanks should be considered as part of the review of projects (SAF-30). All development projects proposed on sites known to be contaminated by hazardous materials shall be reviewed, tested, and remediated for potential hazards (SAF-31).	Yes, with Mitigation	Impact 4.8-1 through 4.8-3	MM 4.8-1 through MM 4.8-3
Circulation				
CIR-13	County seeks to provide a roadway system that maintains current roadway capacities in most locations and is both safe and efficient in terms of providing local access. Install improvements on rural roads and highways throughout the county.	Yes, with Mitigation	Impact 4.12-1 through 4.12-5	MM 4.12-1
CIR-15	County shall maintain and apply consistent highway access standards regarding new driveways to minimize interference with through traffic while providing adequate local access.	Yes, with Mitigation	Impact 4.12-1 through 4.12-5	MM 4.12-1
CIR-16	The County shall seek to maintain an adequate Level of Service on roads and at intersections.	Yes, with Mitigation	Impact 4.12-1 through 4.12-5	MM 4.12-1

Response 19: Alternatives Analysis

Summary of Comments

Several comment letters stated the Draft EIR did not provide an adequate range of alternatives. In addition, commenters stated that the discussions and details presented of selected alternatives were insufficient.

Response

CEQA *Guidelines* § 15126.6 requires that an EIR "describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives." The Lead Agency determined a reasonable range of alternatives to be evaluated in an EIR and, consistent with CEQA, considered these alternatives within the context of achieving project objectives. Additionally, CEQA *Guidelines* § 15126.6 (b) requires consideration of alternatives that could reduce to a less-than-significant level or eliminate any significant adverse environmental effects of a proposed project, including alternatives that may be more costly or could otherwise impede the proposed project's objectives. The range of alternatives evaluated in an EIR is governed by a "rule of reason," which requires the evaluation of alternatives "necessary to permit a reasoned choice." Alternatives considered must include those that offer substantial environmental advantages over the proposed project and may be feasibly accomplished in a successful manner considering economic, environmental, social, technological, and legal factors. An EIR does not need to consider every possible alternative, but must consider alternatives that will foster informed decision-making and public participation. Section 5.0 of the Draft EIR presents two different alternatives to the Proposed Project: the No Project Alternative and the No Timber Conversion Alternative. One additional alternative, the Selective Long-Term Timber Harvest and Management Alternative, was eliminated from further consideration because it either did not reduce significant environmental effects of the Proposed Project or was not considered feasible, consistent with CEQA *Guidelines* § 15126.6.

The Draft EIR appropriately considered a reasonable range of alternatives that were determined with a consideration for each alternative's ability to meet the purpose and need while also reducing environmental impacts. The discussion in Section 5.4 of the Draft EIR provides the reasoning as to why some alternatives were not further considered in accordance with CEQA *Guidelines* § 15126.6(b), which states that "the discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project." The only reasonable alternatives to the Proposed Project are to take no action or develop less vineyard acreage than the Proposed Project by avoiding timber harvest and thus the need to prepare a THP.

CEQA *Guidelines* § 15126.6 requires that a Draft EIR contain only "sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project." A full quantitative analysis for each environmental impact area for each proposed alternative is not required under CEQA or the CEQA *Guidelines*. A "matrix displaying the major characteristics and significant environmental effects of each alternative" is presented in Table 5-1 of the Draft EIR, pursuant to CEQA *Guidelines* § 15126.6. The comparative analysis that compares the levels of impact of each alternative with the Proposed Project provided in the Draft EIR is sufficient under CEQA to allow "informed decision making and public participation."

Response 20: Cumulative

Summary of Comments

Several comments stated that the cumulative analysis presented in Section 6.2 of the Draft EIR was unclear or did not comply with CEQA and the CEQA *Guidelines*.

Response

The CEQA *Guidelines* state that the cumulative impacts discussion does not need to provide as much detail as is provided in the analysis of project-only impacts and should be guided by the standards of practicality and reasonableness. Pursuant to CEQA Guidelines Section 15130(b), this EIR uses projections contained in the Napa County General Plan EIR (2007), General Plan (2008), and related planning documents, which describe or evaluate regional or area-wide conditions contributing to cumulative impacts.

A two-step process was used in preparing the cumulative impact analysis in the Draft EIR, consistent with CEQA *Guidelines* § 15130. First, for each impact area, the impacts of the Proposed Project, in combination with those from other past, present, or reasonably foreseeable projects, were analyzed to assess whether they are cumulatively significant. Then, the effect of the Proposed Project was assessed to determine if it was a considerable contribution to that impact.

Response 21: Moratorium on Vineyard Development

Summary of Comments

Several commenters expressed interest in a moratorium on future vineyard developments in Napa County.

Response

During development of the General Plan, the County provided opportunities for public input regarding land use designations and consulted with local interest groups. The Proposed Project is consistent with the land use designation and zoning designation for the property. A

moratorium on all future development projects is not relevant to the CEQA process for the Proposed Project. The Proposed Project and all future developments requiring County approval will go through a CEQA process to ensure that all potentially significant environmental impacts, including to water supply and biological resources, are analyzed and mitigated to the maximum degree possible through a transparent public process.

Concerns related to County ordinances and General Plan policies allowing development on private properties are beyond the scope of this EIR and the CEQA process. However, commenters can work with the County outside of the CEQA process to address these concerns.

Response 22: Extension Requests

Summary of Comments

Several commenters requested an extension of the comment period on the Draft EIR.

Response

The Notice of Availability (NOA) was released on August 21, 2015. The NOA announced a 45-day comment period, consistent with CEQA *Guidelines* § 15105, extending from August 21 to October 5, 2015. In accordance with CEQA *Guidelines* § 15105 the Lead Agency, CAL FIRE, elected not to grant an extension for the comment period.

3.3 AGENCY AND ORGANIZATION COMMENTS

Letter A1 Mike Hackett, Chairman, Save Rural Angwin, September 10, 2015

Response to Comment A1-01

Comment noted. A discussion of surface water quality, including sediment loading, can be found in Section 4.9.1-2 of the Draft EIR as well as **General Response 7**. Refer to **General Response 4** regarding the location of the project site near the Dunn-Wildlake Preserve.

Response to Comment A1-02

Contrary to the commenter's assertion, the Pre-Harvest Inspection (PHI) is not required for all THPs pursuant to Forest Practice Rules 924.3, which state that "the Director shall determine if a preharvest inspection is necessary" for each THP. This optional meeting is held at the Director's discretion to augment or enhance an agency's review of the THP. The commenter appears to misunderstand the requirements of the Forest Practice Rules, specifically § 1037.3 Agency and Public Review:

> "Upon receipt of the filed plan in accordance with 14 CCR 1037, the Director shall place it, or a true copy thereof, in a file available for public inspection, and shall transmit a copy

> to the Department of Fish and Game, the appropriate California Regional Water Quality Control Board, the Department of Conservation, Division of Mines and Geology *[California Geological Survey]*, the Department of Parks and Recreation, the county planning agency and, if the areas are within their jurisdiction, to the California Tahoe Regional Planning Agency and the California Coastal Commission."

All relevant State and local government agencies are notified of the THP and given the opportunity to attend the PHI. The Regional Water Quality Control Board (RWQCB) and the State Water Resources Control Board (SWRCB) were both notified of the time and location of the PHI and provided with copies of the THP per review in accordance with Forest Practice Rules § 11037.3. However, no State or local agency is compelled to attend the PHI. It should be noted that the PHI is a meeting held by the Licensed Timber Operator (LTO) or Register Professional Forester (RPF) for the resources agencies; it is not a public meeting to which the commenter would have been able to attend.

Response to Comment A1-03

Refer to **General Response 22** regarding extension requests.

Letter A2 Steven Palmer, Director of Public Works & City Engineer, City of St. Helena, September 23, 2015

Response to Comment A2-01

Refer to **General Response 7** for a detailed response regarding water quality impacts to municipal water supplies. Refer to **General Response 6** for details on pesticide use within the project. Contrary to the commenter's assertion, the Draft EIR acknowledges the project site's location within the Bell Canyon Reservoir in Section 2.2 Project Description. The project site's location within a sensitive domestic watershed is discussed throughout the Draft EIR and in Impact 4.9-5. Although the Draft EIR mentioned the "sensitive domestic water supply drainage" throughout the document, it has been clarified in **Section 4.0** of this Final EIR that the sensitive water supply drainage supplies water to the City of St. Helena.

Response to Comment A2-02

It is important to note that the Draft EIR does not claim to rely upon the Bell Canyon Dam as the only mitigation measure against sedimentation of the Napa River. Rather, Section 4.9.1-1 of the Draft EIR notes that the many dams in the Napa River watershed, including the Bell Canyon Dam, have "affected sediment transport processes into the mainstem Napa River by reducing the delivery of the coarse load sediments to the river." This has led to an increase in the proportion of fine-grained substrate in the Napa River, which has been detrimental to spawning salmonids. Therefore, Impact 4.6-1 and 4.9-2 of the Draft EIR analyze and ensure that the

Proposed Project will result in a net decrease in the rate of sedimentation, to ensure compliance with the Napa River sediment TMDL.

Section 4.6.1-3 of the Draft EIR discusses sediment erosion and specific control measures. These measures are explained in additional detail within the project ECP that must be approved by Napa County prior to implementation. These temporary and permanent sediment control measures include: water spreaders, water bars, undisturbed soil and vegetation within stream setbacks, fiber rolls, straw mulch, cleaning, repair, or replacement of existing drainage features as needed; construction of rock stabilizers; grading of diversion ditches and installation of drop inlets; the planting of a winter cover crop; and the implementation and adherence to the Annual Winterization program as presented in detail in the ECP. As discussed in Impact 4.6-1, the rate of sediment leaving the property would decrease with implementation of the ECP. See **General Response 5** for additional information on erosion and sedimentation.

Response to Comment A2-03

The hydrologic report prepared for the Proposed Project by OEI is included as Appendix E of the Draft EIR. The report estimates the anticipated change in runoff that will occur as a result of implementation of the Proposed Project through review of aerial photographs, field visits, and modeling using the USDA TR-55 model. The entirety of the Proposed Project, including tree removal, erosion control measures, and planted cover crop, is included in the modeling via the use of curve numbers and land use estimates. As shown in Tables 3 and 4 within Appendix E and summarized in Tables 4.9-2 and 4.9-3 of the Draft EIR, surface water runoff (both volume and peak flow) will decline from the property in post-project conditions. The cause of the decline in surface water runoff is the change in the landscape from existing conditions to vineyards, which will result in an increase in infiltration rather than overland runoff. As discussed in Impact 4.9-1, the primary reason for the decrease in runoff is the construction of rock checks that would delay peak flow timing. “Another factor contributing to the reduction in runoff, or lower curve numbers, is the use of cover crops within all the vineyard blocks.”

Thus, land that is planted in vineyards and cover crops infiltrates more precipitation than in existing conditions. Precipitation that runs off as surface water will be proportionately reduced by the percentages shown in Impact 4.9-1. This analysis focuses on peak flows during storm events; water that does not flow downhill as surface flow during or immediately following a storm will not disappear. The shift from surface water runoff to infiltration is relatively modest, but will occur at all sub-watersheds for all modeled storm events. Rather, that water will infiltrate and become groundwater in the same watershed. That water will either recharge the aquifer or return to the surface at some downhill location as a spring or seep. In either event, the water will not be “lost” to the watershed. Given the underlying geology of volcanic rock and the

associated groundwater recharge rates, a portion of the increased infiltrated water is likely to resurface over time as it intercepts bedrock and moves down gradient towards streams.

Response to Comment A2-04

Comment noted. Refer to **General Response 6** regarding the use of pesticides with the Proposed Project.

Response to Comment A2-05

Refer to **General Response 1** regarding statements of opinion and **General Response 19** regarding the adequacy of the alternatives analysis.

Response to Comment A2-06

Due to the location and site conditions of the proposed vineyard, water is not anticipated to be needed for frost protection. Should the need for frost protection arise in the future, the project applicant would utilize wind machines.

Response to Comment A2-07

Per Appendix E of the Draft EIR, the Hydrologic Analysis for the Proposed Project was completed by Matthew O'Connor, Certified Engineering Geologist of O'Connor Environmental Inc. The Hydrologic Analysis report is signed and sealed by O'Connor.

Response to Comment A2-08

Appendix A of the Erosion Analysis (included as Appendix F to the Draft EIR) has been reattached and resubmitted with this Final EIR. Napa County RCD reviewed the ECP, the USLE methodology and results, and the Erosion Analysis (Appendix F) and found the results to be technically adequate and to meet the no-net-increase in sediment standards established by Napa County General Plan Policy CON-48. Refer to Appendix L to the Draft EIR for the technical adequacy memorandum provided by Napa County RCD.

Response to Comment A2-09

Refer to **General Response 2** regarding the adequacy of the Draft EIR.

Letter A3 Scott Wilson, Regional Manager, California Department of Fish and Wildlife, September 29, 2015

Response to Comment A3-01

Commenter correctly describes the project description provided in Section 3.0 of the Draft EIR.

Response to Comment A3-02

Comment noted. As discussed in Impact 4.4-1, Napa County Ordinance 1219 adopts Sections 18.108.027 of the Napa County Code, which limits development on a property so that it maintains at least 60 percent of the tree canopy and 40 percent of the shrub canopy, as compared with 1993 aerial photography. Therefore, each property has a limited acreage that can be developed per Napa County Ordinance 1219, providing a de facto conservation easement for the remainder of the property. There are no reasonably foreseeable developments or uses proposed for the areas designated as HRA. There are no reasonable or foreseeable alterations or modifications to the County ordinance; consequently, there is no need for a further mechanism to protect these areas. The implementation of the HRA is a feasible mitigation measure that "avoid[s] or *substantially lessen*[s]" the project's significant impacts (PRC § 21002), and is therefore in compliance with CEQA and the CEQA *Guidelines*.

Response to Comment A3-03

CAL FIRE acknowledges the importance of oak woodlands and the slow growth rate inherent in most oak species. The methodology required by Mitigation Measure 4.4-1 (THP Mitigation #15) for the oak enhancement areas within the HRA was designed to off-set the temporal loss of oak habitat. The HRA enhancement techniques were developed under the direction of a qualified biologist and the RPF, who noted the large number of black oak saplings in the understory within these areas. By girdling pine trees and cutting selected overstory canopy trees to reduce competition, the already established oak seedlings will receive the sunlight necessary to become dominant in the overstory. As such, the HRA will allow for the natural oak seedlings to grow, which will avoid the delays and potential failure rates associated with artificial replantings. As discussed further in **General Response 12**, Mitigation Measure 4.4-1 (THP Mitigation #15) has been revised in this Final EIR to require annual monitoring after development of the project for a minimum of 5 years to ensure that the HRA is successful.

Response to Comment A3-04

As discussed further in **General Response 13**, long-term monitoring of the Napa lomatium mitigation has been added to the Final EIR.

Response to Comment A3-05

Refer to **General Response 14** regarding habitat fragmentation. A new figure (**Figure 3-1**) has been created for this Final EIR to show the HRA in relation to the surrounding open space habitat. As shown therein, the HRA is connected to wildlife corridors off of the property.

Letter A4 Christina Aranguren, California Fisheries & Water Unlimited, October 2, 2015

Response to Comment A4-01

Refer to **Response to Comment A1-02** regarding the PHI. Utilizing groundwater for frost protection is not proposed under the project; refer to Section 3.0 of the Draft EIR for an accurate project description.

Response to Comment A4-02

The listing status of the Napa River as impaired for sediment, temperature, and pathogens is discussed on pages 4.9-4 through 4.9-6 of the Draft EIR. Although the Napa River was previously listed for nutrient pollution, given improving water quality in the non-tidal portions of the Napa River, the San Francisco Bay RWQCB adopted Resolution No. R2-2014-0006 on February 12, 2014 to delist the non-tidal Napa River for nutrients. It is currently being processed by the USEPA. This has been clarified in **Section 4.0** of this Final EIR. Water quality is analyzed in Impact 4.9-2.

Refer to **General Response 20** regarding the adequacy of the cumulative impact analysis and **General Response 7** regarding water quality.

Response to Comment A4-03

Refer to **General Response 8** regarding the applicability of SGMA to the Proposed Project.

Response to Comment A4-04

As stated in Section 4.9.2-2 (page 4.9-9) of the Draft EIR, “the existing beneficial uses designated for the Napa River are agricultural, municipal, and domestic supply, cold freshwater habitat, fish migration, navigation, preservation of rare and endangered species, water contact and non-water contact recreation, fish spawning, warm freshwater habitat, and wildlife habitat.” Therefore, Impact 4.9-2 analyzes the potential for the Proposed Project to impact the Napa River and associated beneficial uses. Refer to **General Response 7** and **General Response 20** regarding water quality impacts and the cumulative analysis, respectively.

Response to Comment A4-05

The USDA’s TR-55 watershed model was used to analyze the potential for the Proposed Project to impact surface water runoff, including both peak flows and total volume of runoff. As shown in Impact 4.9-1 and Appendix E to the Draft EIR, the Proposed Project would result in slight reductions to peak runoff and volume following all storm events (the 2-, 10-, 50- and 100-

year storm event) due to the erosion control and runoff attenuation measures proposed in the ECP. Refer to **General Response 5** regarding erosion and sedimentation.

Response to Comment A4-06

As stated in Section 3.4.2-4 of the Draft EIR, approximately 3.1 acres of the project site will accommodate internal farm avenues for farm trucks and vineyard maintenance operations. However, no road construction is proposed. The use of these internal farm avenues is analyzed with the entirety of the Proposed Project for erosion and sedimentation impacts in Impact 4.6-1. The use of existing roads (namely Friesen Drive) is discussed in Impact 4.6-1, and Mitigation Measure 4.6-1 (THP Mitigation #22) limits the use of the existing low water crossing on Friesen Drive (near the entrance to the Land Trust Property) to ensure that erosion is limited.

Response to Comment A4-07

As discussed in-depth in Section 4.9.1-1 of the Draft EIR, the property receives approximately 125 acre-feet (af) of rainfall (37.43 acre property multiplied by the average precipitation of 40 inches) per year. This average precipitation is the long-term average from 1940 to 2015, as measured at the Angwin Pacific Union College National Oceanic and Atmospheric Administration Cooperative Station (coop station) 3 miles southeast of the project site. Rainfall totals for water years 2012 through 2015 are included in the station's precipitations averages.

Response to Comment A4-08

A peer-reviewed publication by Grismer and Asato found analyzed groundwater impacts due to the conversion of oak woodland or oak savanna to vineyard in Sonoma County, and found that an oak woodland of 45 percent cover was equivalent to a vineyard in yearly balance of groundwater. This is discussed further in **General Response 8**. In terms of groundwater recharge, the proposed vineyard may increase infiltration due to the use of cover crops and attenuation basins (refer to **Response to Comment A2-03**). Refer to **Response to Comment A4-07** above regarding the inclusion of drought years 2012 through 2015 in the analysis presented in the Draft EIR.

Response to Comment A4-09

As discussed further in **General Response 10**, vineyards and olive orchards are considered one of the best fire-resistant crops to provide a fuel break in Mediterranean climates (Keeley et. al, 2012). Furthermore, as explained in Impact 4.3-1 of the Draft EIR, on-site mulching would be the primary method used for the removal of vegetated material; however, in the event that burning is required of cleared vegetation, it would occur during the wet season (October 30 to April 1) as permitted by governing agencies and in accordance with the Bay Area Air Quality Management District (BAAQMD) Regulation 5, subsection 5-401.2 (BAAQMD, 2008).

Additionally, all emergency access in place for surrounding residents and vineyards would exist during and after completion of the Proposed Project. As such, existing emergency protocols for the area will remain intact.

The commenter refers to a threshold value associated with cumulative effects of fire danger for the project site. No such value was calculated for the Draft EIR nor is it required by CEQA *Guidelines* § 15128, which discusses the amount of analysis required for less-than-significant environmental impacts. As stated therein, "an EIR shall contain a statement *briefly* indicating the reasons that various possible significant effects of a project were determined not to be significant and were therefore not discussed in detail in the EIR." Impact 4.8-5 of the Draft EIR notes that the Proposed Project will result in development of a fuel break that will provide beneficial protection to neighboring properties.

Response to Comment A4-10

Given that the Proposed Project would reduce the risk of fire by providing a fire break, as discussed in **Response to Comment A4-09** above, the Draft EIR is not required to provide a detailed analysis of water sources for fire protection purposes in accordance with CEQA *Guidelines* § 15128. The water source for future fire-fighting operations would remain unchanged after implementation of the Proposed Project.

Response to Comment A4-11

Consistent with the ECP, all disturbed areas would be planted with a vegetative cover crop, using the Davis Estate Mix at 100 pounds per acre (45 percent barley, 45 percent annual rye grass, and 10 percent crimson clover). "Fawn" tall fescue would be added to the mix at five pounds per acre for use on internal farm avenues and turn around areas that are not rocked (see the ECP and Section 3.4.2-3 of the Draft EIR). As discussed further in **General Response 10**, vineyards and olive orchards (including cover crops) are considered one of the best fire-resistant crops to provide a fuel break in Mediterranean climates (Keeley et. al, 2012).

Response to Comment A4-12

As stated in Section 4.3 of the Draft EIR, on-site mulching or burning may be used for the removal of vegetated material. If burning events do occur, it would be in accordance with the BAAQMD Regulation 5 and, as shown in Table 4.3-4 of the Draft EIR, particulate emissions would not exceed BAAQMD thresholds. A less than significant impact would occur due to burning of vegetated material (slash) in all seasons.

As shown in Table 4.7-2, no mitigation is required to be implemented for the loss of sequestration due to vegetative matter (trees and plant life) removal. Furthermore, as stated in

Section 4.7 of the Draft EIR, the BAAQMD CEQA Guidelines does not recommend including the loss of sequestration due to a reduction in vegetative matter (trees and plant life). As discussed further in **General Response 16**, the construction of the Proposed Project would generate 3,032 MT per year of carbon dioxide equivalent (CO_2e), much of this due to timber removal. However, retention of some timber as lumber reduce the total GHG emissions to 1,181 MT/yr of CO_2e, as discussed in Impact 4.7-1. This reduction in GHG emissions of 61 percent ensures compliance with local climate action plans and the State of California's 32 percent reduction goals established by AB 32.

Response to Comment A4-13

Refer to **General Response 16** regarding the methodology used to estimate GHG emissions, which followed the most up to date methodology as required by BAAQMD and CARB.

Although there is evidence that global climate change will affect future precipitation, hydrological, and biological resources, the exact effect of climate change on precipitation and streamflow within the project watershed in the future is uncertain. The analysis of potential impacts to surface flows (peak discharge and volume) were analyzed in 2-, 10-, and 100-year storm events in Impact 4.6-1. The analysis of the Proposed Project in multiple storm scenarios provides a full range of impacts that are applicable to current and future conditions.

Because specific effects of climate change on future resources within the watershed are uncertain, CEQA *Guidelines* § 15145 does not require a quantitative impact analysis. According to CEQA *Guidelines* § 15145, "if, after thorough investigation, a Lead Agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate discussion of the impact." As such, no specific quantitative analysis will be provided in this Final EIR for future speculative impacts.

Response to Comment A4-14

Refer to **General Response 8** for additional discussion regarding groundwater and water availability, including as it relates to the current California drought. Refer to **Response to Comment A1-02** regarding the PHI and the San Francisco RWQCB.

Letter A5 Dan Mufson, President, Napa Vision 2050, October 3, 2015

Response to Comment A5-01

Refer to **General Response 1** regarding statements of opinion and **General Response 22** regarding extension requests.

Letter A6 Karin Troedsson, Staff Attorney, Land Trust of Napa County, October 3, 2015

Response to Comment A6-01

Refer to **General Response 1** regarding non-substantive comments and statements of opinion. The Proposed Project's location near the Dunn-Wildlake Preserve is discussed further in **General Response 4**.

Response to Comment A6-02

Refer to **General Response 2** regarding the adequacy of the Draft EIR.

Response to Comment A6-03

As required by CEQA *Guidelines* § 15126.4, the baseline environmental setting for each relevant environmental resource along with the relevant federal, State, and local regulatory laws, codes, ordinances, and standards are described in Section 4.0 of the Draft EIR, as well as mitigation measures where appropriate to reduce impacts to less-than-significant levels. Throughout the Draft EIR, the location of the project site adjacent to the Napa Land Trust property (Dunn-Wildlake Preserve) is acknowledged; see Draft EIR Sections 3.2, 4.1.2-2, 4.9.1-2, and 4.10.1-3, as well as Impacts 4.4-1 and 4.6-1.

The potential impacts to oak woodlands are analyzed in Impact 4.4-1, which found that the impact to 5.32 acres of Mixed Oak Woodland within the project site would be a potentially significant impact under CEQA. Therefore, Mitigation Measure 4.4-1 (THP Mitigation #15) requires the permanent retention and enhancement of areas on the property outside of the project site to mitigate for impacts to oak woodlands. Refer to **General Response 12** regarding the HRA. Refer to **General Response 3** and **General Response 4** regarding the consideration of impacts to aesthetics and the Dunn-Wildlake Preserve, respectively.

Response to Comment A6-04

CAL FIRE acknowledges that the Draft EIR was inconsistent in terminology when describing the slopes on the project site and property. Existing slopes within the project site range from 8 to 27 percent, whereas there are much steeper slopes elsewhere on the property that would not be impacted by the Proposed Project. This has been clarified in the Final EIR. CAL FIRE apologizes for any confusion caused to the reader. However, as shown in the ECP prepared for the Proposed Project, there are no vineyards proposed on slopes greater than 50 percent as claimed by the commenter.

The project description itself, including the proposed timber harvest elements, erosion control measure installation, and use of cover crop, is consistent throughout the document and contains all required elements pursuant to CEQA *Guidelines* § 15124.

Response to Comment A6-05

It is unclear how the Draft EIR "lacks a full description of the ECP" as claimed by the commenter, when it is discussed extensively in Sections 3.4.2 and 3.4.3 and replicated in Figure 3-4. It is explicitly noted that blasting may be required on page 3-12, which states "ground preparation for vineyard installation would result in soil ripping, earthmoving, and grading activities; blasting may also be used to clear some rock areas." Draft EIR Section 3.4.3-3 notes that "construction of the Proposed Project is anticipated to occur over one year, with ECP related construction and vineyard planting occurring only during the dry months." The Proposed Project analyzed in the Draft EIR includes the entirety of the project components discussed in Section 3.4 and the ECP (Appendix B), including the erosion control features outside of the net vineyard area that are clearly depicted in Figure 3-4.

Response to Comment A6-06

The *Laurel Heights Improvement Assoc. v. Regents of University of California* (1988) 47 Cal.3d 376 decision explained that "an EIR must include an analysis of the environmental effects of future expansion or other action if: (1) it is a reasonably foreseeable consequence of the initial project; and (2) the future expansion or action will be significant in that it will likely change the scope or nature of the initial project or its environmental effects." The Draft EIR prepared for the Proposed Project included all components of the proposed vineyard development, including the precursor timber harvest phase, implementation of the ECP, and ongoing vineyard maintenance. As clearly stated in Table 2-1 of the Draft EIR, implementation of mitigation measures would reduce all significant environmental impacts to less-than-significant levels, and there are no significant and unavoidable impacts as a result of the Proposed Project. Refer to **General Response 2** regarding the adequacy of the Draft EIR.

Response to Comment A6-07

As discussed in **General Response 3**, an alteration of the landscape from natural habitat to a vineyard is not considered, in itself, a significant impact to the physical environment. CAL FIRE acknowledges that the aesthetic character of a vineyard differs from the aesthetic character of natural habitat. Those who reside nearby may prefer one visual landscape to another. Such preferences may be both sincere and strongly held. Such preferences do not, however, constitute an environmental impact that is the focus of CEQA analysis. Rather, the CEQA analysis focuses on whether the Proposed Project would have a substantial adverse effect on a scenic vista, or substantially damage scenic resources. A change in the visual character of the

landscape, from natural habitat to a vineyard, is not considered substantially adverse. Although proposed vineyard Block A would be visible from the entrance to the Land Trust Preserve, this does not constitute a "substantial adverse effect on a scenic vista" or a "substantial degradation of the visual character of the site." Therefore, a less-than-significant impact would occur. Refer to **General Response 3** and **General Response 4** regarding the consideration of impacts to aesthetics and the Dunn-Wildlake Preserve, respectively.

Response to Comment A6-08

The commenter asserts that the Draft EIR does not acknowledge that the project site is surrounded by natural habitat. However, in 4.1.2-2, the Draft EIR clearly states, "The lands to the west, east and to some extent the south, are owned by the Napa Valley Land Trust (Land Trust). The 3,030 acre Dunn-Wildlake Ranch Preserve Land Trust property (Preserve) is utilized for recreational hiking."

This comment states that the Draft EIR improperly suggests that hunting activities occur because of references to a "hunting lodge" located on the Preserve's land. The commenter states that it has not been used for hunting (or any other activity) since the Land Trust acquired the surrounding land. It should be noted that the Napa Land Trust's own website refers to the Dunn-Wildlake Ranch as a former hunting club (see: http://www.napalandtrust.org/Preserve/Permanent-Preserve-Network/). Consistent with the Napa Land Trust's own publically available information, the Draft EIR references the hunting lodge that exists on the Dunn-Wildlake Preserve. In fact, Section 4.1.2-2 of the Draft EIR specifically mentions that the hunting lodge is a remnant of past ownership of the property: "Also, a hunting lodge is located on the Land Trust west of the property from prior property ownership" (page 4.1-2 and 4.10-1). Nowhere does the Draft EIR state that the Preserve is actively or currently used for hunting activities.

Section 4.4.3-1 of the Draft EIR notes that Napa County has some of the highest levels of biodiversity compared to the rest of California. The potential impacts to biological resources are discussed in Impacts 4.4-1 through 4.4-9.

Response to Comment A6-09

The commenter correctly notes that Friesen Drive passes through Napa Land Trust property, then through the project site, before reaching the entrance to the Dunn-Wildlake Preserve. Although proposed Block A would be visible from the current parking area for the Preserve (land owned by the Napa Land Trust), one must pass through the project site on Friesen Drive to reach this area of the Preserve. Friesen Drive is a private road that bisects the property owned by the Applicant. Thus, to access the Preserve and the parking area, one would have to travel along Friesen Drive and pass through not only the project site, but also multiple parcels with

various other compatible land uses including open space, vineyard, and other agricultural uses, all of which are consistent with the existing AW zoning. As such, any development of the property as permitted under the AW zoning would be visible from Friesen Drive and from the Preserve. This does not constitute a significant impact in and of itself, consistent with CEQA *Guidelines* Appendix G. See **General Response 3** for a discussion on aesthetics as it relates to the Proposed Project, as well as a discussion of the use of reflective ribbon as a protected agricultural practice under Napa County's right-to-farm ordinance.

Response to Comment A6-10

Queries of the CNPS rare plant database, California Natural Diversity Database (CNDDB), and USFWS were run in support of the BRA prepared for the Proposed Project and included as Appendix D to the Draft EIR. The CNPS did not identify either the tall snapdragon (*Antirrhinum virga*) or nodding harmonia (*Harmonia nutans*) as occurring on the project quad or the surrounding quads. They were similarly not identified as occurring in the project vicinity by the USFWS or CDFW. A complete list of plant species observed on the project site is provided in the BRA, and these two species would have been listed had they been observed. Nodding harmonia, a CRPR 4.3 plant, has a bloom season of March to May, while tall snapdragon (CRPR 4.3) has a bloom season of June to July. The biological and botanical surveys conducted by Kjeldsen Biological Consulting on February 22, March 19, April 17, May 13, and June 3, 2013 were within the evident and identifiable bloom season for both species, and they would have been noted if they were to occur. It should be noted that tall snapdragon germination follows fire events, and as it has not been observed since 2008 and there have been no fires on the property in recent years, this species would have been extirpated from the site due to out-competition (assuming it was present in the first place). There is no evidence before CAL FIRE that these species would be impacted by the Proposed Project.

Response to Comment A6-11

Impact 4.4-5 of the Draft EIR analyzed impacts to nesting and migratory birds, and found that the Proposed Project could have a significant impact to these species. Therefore, Mitigation Measure 4.4-5 (THP Mitigation #13) is provided to reduce impacts to less-than-significant levels. Please refer to pages 4.4-50 through 4.4-51 of the Draft EIR.

Response to Comment A6-12

The commenter lists the following 10 plant species as occurring within a 10-mile radius of the property:

- *Brodiaea leptandra* – narrow-anthered brodiaea (CRPR 1B.2, blooms May – July);
- *Erigeron bioletti* – streamside daisy (CRPR 3, blooms June – October);

- *Erigeron greenei* – Greene's narrow-leaved daisy (CRPR 1B.2, blooms May – September);
- *Eriogonum umbellatum var. bahiiforme* – bay buckwheat (CRPR 4.2, blooms July – September);
- *Juglans hindsii* – northern Californian black walnut (CRPR 1B.1, blooms April – May);
- *Layia septentrionalis* – Colusa layia (CRPR 1B.2, blooms April – May);
- *Leptosiphon jepsonii* – Jepson's leptosiphon (CRPR 1B.2, blooms March – May);
- *Leptosiphon latisectus* – broad-lobed leptosiphon (CRPR 4.3, blooms April – June);
- *Monardella viridis* – green monardella (CRPR 4.3, blooms June – September); and
- *Triteleia lugens* – dark-mouth triteleia (CRPR 4.3, blooms April – June).

The CNDDB, the CDFW's database for sensitive plant and animal species, was reviewed prior to releasing the Draft EIR and again after receiving this comment letter. The CNDDB is part of an international network of natural heritage programs, maintained by the NatureServe and supported by information from CDFW, USFWS, and other non-profit groups. All documented and reported locations of special status plants and animals are found in the CNDDB. The data is not public and the level of detail that may be presented in public maps is limited to protect the location of species and their habitats. However, the maps were accessed in the preparation of the Draft EIR and this Final EIR, including a 5- and 10-mile radius map to evaluate the claims made in this comment.

Of the 10 species listed in the comment letter, 6 were not located within a 10-mile radius of the project site. Only narrow-anthered brodiaea, Greene's narrow-leaved daisy, Colusa layia, and Jepson's leptosiphon were found to occur within the area stated by the commenter. The botanical surveys conducted during preparation of the BRA covered the bloom season of each of the special status plants listed above, with the exception of bay buckwheat. None of these plants were observed. However, bay buckwheat only occurs within elevation ranges of 700 to 2,200 meters (2,300 to 7,200 feet) above mean sea level (amsl), and the project site is located at an elevation of approximately 2,000 feet amsl. In addition, the CNDDB does not list this species as occurring within a 10-mile radius of the property. Therefore, the project site is outside of the known elevation range and geographic range of this species and it would not occur on the property; there would be no impact to this species.

Response to Comment A6-13

As discussed in Section 4.4.6-1 of the Draft EIR, a project would have a significant impact on biological resources if it would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS;
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFW or USFWS;
- Have a substantial adverse effect on federal protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal estuaries) through direct removal, filling, hydrological interruption, or other means;
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Impacts to “native species” are not significant under CEQA provided that they are not special status as defined by CDFW, USFWS, or Napa County. In accordance with Appendix G of the CEQA *Guidelines*, the Draft EIR analyzes impacts to sensitive habitat (Impact 4.4-1), waters of the U.S. and riparian habitat (Impact 4.4-2), special status plants and animals (Impact 4.4-3 through 4.4-8), and wildlife movement (Impact 4.4-9). The potential impacts to those biological resources included the entirety of the Proposed Project as described in Section 3.4, including blasting, timber harvesting, and the use of agrichemicals.

The proposed cover crop species listed in Section 3.4 and the ECP (Appendix B to the Draft EIR) were chosen based on their ability to stabilize soil and provide erosion benefits. As stated in the ECP, an alternate seed mix may be used after review and approval by Napa County. It is not the intent of the project applicant to deliberately introduce invasive plants to the project site. None of the proposed seed mix species are listed as having a high rating of invasiveness by the California Invasive Plant Council (CalIPC) database (CalIPC, 2016). The use of beneficial predators as part of IPM practices is an encouraged and well-studied mechanism to reduce the amount of pesticides used on a property. For example, lady bugs are often used to control aphid populations and western predatory mites are often used to control pest mites (UC ANR, 2015).

Response to Comment A6-14

The western pond turtle is a habitat generalist and will traverse terrain until suitable habitat for nesting and overwintering is reached. Given that suitable habitat is directly adjacent to No

Name Lake, it is highly unlikely that any western pond turtles would traverse across Friesen Drive to enter the project site, which does not contain appropriate soils for estivation. Refer to **General Response 11** regarding the western pond turtle, including the petition for listing that is currently being considered by the USFWS.

Response to Comment A6-15

It appears the commenter misrepresented or misunderstood the impact analysis presented in Impact 4.4-4 for northern spotted owl (NSO). As stated on page 4.4-49 of the Draft EIR, the "nearest northern spotted owl activity center is located 1.6 miles from the project site," not less than 1 mile as stated by the commenter. Additionally, the commenter incorrectly states that the 0.5 acre patch of suitable NSO habitat on the property is the northern tip of 11 acres of suitable habitat. In actuality, the correct discussion from the Draft EIR states that:

> "Although there is 0.5 acre of forested habitat on the project site that would meet the definition of suitable NSO habitat as set forth in the USFWS guidelines, this small area is isolated within a larger *11-acre patch of landscape that is unsuitable NSO habitat*."

To summarize, the nearest NSO activity center is greater than 1.6 miles from the project site, and the project site contains a small amount (0.5 acre) of marginally suitable NSO habitat that is isolated from any other NSO habitat within a larger 11-acre patch of unsuitable habitat. Refer to **General Response 20** regarding the adequacy of the cumulative analysis in the Draft EIR.

Response to Comment A6-16

The intent of Mitigation Measure 4.4-5 (THP Mitigation #13) was to require pre-construction surveys to provide protection for nesting and migratory birds, which has been clarified in this Final EIR. To ensure compliance with CEQA *Guidelines* § 15126.4, Mitigation Measure 4.4-5 (THP Mitigation #13) now reads:

> **Mitigation Measure 4.4-5:** The Applicant shall implement the following measures to avoid disturbing any special status bird species nesting on the project parcel in accordance with the following CDFW-recommended measures:
>
> If project activities are scheduled between February 15 and September 15, the following surveys and avoidance measures for nesting birds shall be implemented, as recommended by CDFW. ~~recommends surveys and avoidance measures for nesting birds.~~ With respect to surveys for nesting bird and raptor species, ~~CDFW recommends that the project specifies:~~ 1) nest surveys shall be conducted no earlier than 14 days prior to tree removal and/or breaking ground (surveys shall ~~should~~ be conducted a minimum of 14 days prior to disturbance), 2) in the event that nesting birds are found,

the project applicant shall ~~should~~ consult with CDFW and obtain approval for nest-protection buffers prior to tree removal and/or ground disturbing activities, and 3) nest protection buffers shall ~~will~~ remain in effect until the young have fledged. All nest protection measures shall ~~should~~ apply to off-site impacts and within 500 feet of project activities. If a lapse in project-related work of 15 days or longer occurs, another focused survey and, if required, consultation with CDFW, shall ~~will~~ be required before project work can be reinitiated. If active nests are found during a preconstruction survey, 300-foot no-disturbance buffer zones shall be created around active raptor and songbird nests and shall be maintained until it is determined by a qualified biologist that all young have fledged. These buffer zones may be modified in coordination with CDFW based on existing conditions at the project site. Buffer zones shall be fenced with temporary construction fencing and remain in place until the end of the breeding season or until the young have fledged. If a 15-day or greater lapse of project-related work occurs during the breeding season, another bird preconstruction survey and consultation with CDFW will be required before project work can be reinitiated.

Response to Comment A6-17

Impact 4.4-6 states that development of the Proposed Project would have the potential to affect special status bat species. Mitigation Measure 4.4-6 (THP Mitigation #12) provides for habitat assessment and pre-construction surveys for special status bat species that would reduce potential impacts to less than significant. Conducting the surveys no more than three days prior to the start of construction ensures that the surveys will provide an accurate portrayal of the conditions on the project site immediately prior to construction and will ensure that conditions will not change between the survey and the start of construction. If bats are detected, construction would be halted in accordance with the mitigation measure during focused presence/absence surveys and consultation with CDFW, as required.

Response to Comment A6-18

To offset the removal of oak woodlands as part of the Proposed Project, the HRA shall be created on the property to protect oak woodlands via two mechanisms: retention and enhancement. Mitigation for the 5.32 acres of oak woodland impacted by the project at a 2:1 ratio would necessitate 10.6± acres of high value woodland habitat be enhanced and maintained within the property. The HRA would contain 13.1 acres, which exceeds the 2:1 ratio of mitigated versus impacted oaks required by the Napa County General Plan Policy CON 24. Pursuant to the Oak Woodlands Conservation Act (Section 21083.4 of the Public Resources Code), Napa County protects against the conversion of oak woodlands that will have a significant effect on the environment by implementation of General Plan Policies CON 24, CON-28, and CON-29. Establishment of this HRA is in compliance with all local and State policies and regulations.

The intent of the HRA is to increase the quality and quantity of oak woodland habitat, develop forest resources, improve water quality, and sequester carbon. With implementation of Mitigation Measure 4.4-1 (THP Mitigation #15) in the Draft EIR, explained above, impacts to oak woodlands would be reduced to less-than-significant levels in accordance with CEQA *Guidelines* § 15126.4. Approximately 3.5 acres of the HRA include high-value oak woodlands near riparian corridors that would be retained, while the remaining 9.6 acres within the HRA include the enhancement areas that would receive the oak enhancement and maintenance techniques discussed in Mitigation Measure 4.4-1 (THP Mitigation #15). Refer to **General Response 12** and **Response to Comment A3-02** regarding the mechanism for long-term protection of the HRA; the reliance on Napa County Code Sections 18.108.027 for permanent protection is a sufficient "legally binding instrument" in accordance with CEQA *Guidelines* § 15126.4 (a) (2).

As discussed further in **General Response 12**, Mitigation Measure 4.4-1 (THP Mitigation #15) has been revised in this Final EIR to require annual monitoring after development of the project for a minimum of 5 years to ensure that the HRA is successful.

Response to Comment A6-19

The HRA is required by both Mitigation Measure 4.4-1 of the Draft EIR and Mitigation Measure 15 of the THP. The THP provides more details regarding the methodology of the habitat enhancement as proposed by the RPF. As stated on page 69 of the THP:

> "Approximately 30 to 40% of the vegetation is presently composed of black oak, but most of these are in the understory and are in competition with Ghost Pine and or Manzanita. The proposal is to remove this competition, allowing the existing black oak to release and capture a more dominant role in the canopy. This will be accomplished by the use of chainsaws to cut the manzanita and the Ghost Pine. The manzanita will be left in place to provide protective habitat for birds and animals. The Ghost Pine will be removed if they can be accessed from the existing road. However, most of it will be felled and/or girdled. Girdling of the Ghost Pine will create snag habitat presently lacking in some areas. Falling of many of these pines would damage the existing black oak, whereas snag recruitment will eliminate this disturbance. No mechanical equipment is allowed in the HRA, except on the existing Friesen Drive. All chainsaw work done on the Ghost Pine and manzanita shall be done during the month of November."

The commenter incorrectly cites General Plan Policy CON-24 as providing protection for chaparral habitat, when in actuality this policy discusses oak woodland habitat only. The complete text of this General Plan policy is available on page 4.4-10 of the Draft EIR. In fact,

most chaparral communities are not considered sensitive by CDFW or the County; in Napa County alone, Manzanita Chaparral Alliance covers 8,603 acres and Chamise Chaparral Alliance covers 30,911 acres. The only time chaparral communities are considered sensitive or limited distribution in Napa County is when they are a serpentine community, which does not occur on the property.

Although chaparral is not designated as a sensitive habitat and is a common biotic community in the County, CAL FIRE acknowledges that there is an inherent value to native habitat and unnecessary disturbance to these habitats should be minimized. As discussed above, no mechanical equipment is allowed in the HRA, except on the existing Friesen Drive, and all enhancement activities will be accomplished by hand with a chainsaw. It is unclear how the commenter has determined that the enhancement activities would "reduce the structural and compositional complexity of the habitat," when the activities are specifically designed to increase the complexity of the habitat. Girdling of the pines will create snag habitat which is presently lacking in some areas, and the manzanita will be left in-place to provide habitat for birds and animals. Refer to **General Response 12** regarding the use of the HRA as an appropriate mitigation measure in accordance with CEQA *Guidelines* § 15126.4.

Response to Comment A6-20

The commenter is correct that Napa County Code 18.108.060 requires that "no construction, improvement, grading, earthmoving activity or vegetation removal associated with the development or use of land" may occur on slopes greater than 30 percent. This is why the Proposed Project limited the development of vineyards to the areas shown in the ECP, which have slopes ranging from 8 to 27 percent. However, the HRA is not considered a "development" and the enhancement activities are not considered a "land use" pursuant to Napa County Code, as it is a mitigation area that will be retained for habitat benefits.

In addition, the commenter claims that the existing easement on the property prohibits the oak enhancement activities; this is not reflected in the language of the easement. Specifically, Section (d) of the easement states that "no use shall be made of that portion of the property… which compromises said watershed other than for grazing, irrigated pasture and hay raising, horseback riding, hiking, picnicking, and similar agricultural or recreational open space uses which *shall not contaminate, defile, or otherwise pollute the water supply*." As stated above, the HRA is not considered a "land use" under Napa County Code, or by extension the terms of the easement. Given that the HRA will not cause water quality impacts, land disturbance, or other pollution issues, and is associated with an agricultural use that is allowed in the easement, it is not considered a violation of the existing easement to Howell Mountain Mutual Water Company.

Response to Comment A6-21

Impact 4.9-5 analyzes the Proposed Project's consistency with Napa County Code 18.108.027, also known as the "60/40 Rule." As stated therein, "there were 10.17 acres of tree canopy and 25.24 acres of brush cover [in 1993]. The Proposed Project would retain 6.32 acres (62.1 percent) of tree canopy and 14.39 acres (57.0 percent) of brush on the property, which conforms with Napa County Code." The supporting analysis has been included as **Appendix Q** to this Final EIR. The HRA oak enhancement activities will not result in a long-term loss of tree canopy, as the ultimate intent is for existing oak saplings to replace pines in the overstory.

Response to Comment A6-22

The Napa County Baseline Data Report (BDR) states that Ponderosa pine forests are sensitive in Napa County due to their limited distribution, but it also acknowledges that Ponderosa pine trees themselves are not sensitive and can be found in many other habitat types:

> "Ponderosa pine forests are considered sensitive communities because they are rare within the County, covering less than 200 acres, and occur at the edge of regional distribution. Ponderosa pine forests in the County are concentrated in the Angwin area. In addition, *Ponderosa pine is a significant element of Douglas-fir-Ponderosa pine forests*, which cover almost 9,200 acres, or almost 2% of the County."

The Napa County BDR and the Draft EIR (page 4.4-20) acknowledge that Ponderosa pine may be co-dominant within a Douglas Fir Forest but that it should still be classified as a Douglas Fir Forest; the presence of some Ponderosa pine trees does not make the habitat type a Ponderosa Pine Forest that is considered sensitive by Napa County. As designated by the Manual of California Vegetation, a Ponderosa Pine Forest is one that is "sole, dominant, or important" in the overstory (Sawyer et al., 2009). Although Ponderosa pines occur on the property, there are no habitats that can be designated as Ponderosa Pine Forests on the property.

Response to Comment A6-23

Refer to **Response to Comment A6-19** regarding the prohibition of mechanical equipment within the HRA to protect water quality and **General Response 6** regarding the use of stream setbacks as an appropriate and effective means of protecting water quality for both on- and off-site waters.

Response to Comment A6-24

Refer to **General Response 14** regarding wildlife corridors.

Response to Comment A6-25

The impacts to forestry resources are analyzed in Impact 4.2-1 of the Draft EIR, which found that due to the limited size and scope of the forest land within the project site (approximately 10 acres), the Proposed Project would result in a less-than-significant impact to the overall forest land of the State and region. The commenter incorrectly states that the entire 13.6-acre project site is forested, when there are only 10 acres of forested land subject to the THP, as discussed in Section 3.4.1 and Impact 4.2-1.

In determining the level of significance of impacts to the environment, including the 10 acres of timberland mentioned by the commenter, CAL FIRE considered all scientific and legal information in the administrative record consistent with CEQA *Guidelines* § 15064 (b) which states that:

> "The determination of whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on scientific and factual data. An ironclad definition of significant effect is not always possible *because the significance of an activity may vary with the setting* (*emphasis* added)."

The CEQA *Guidelines* provides some flexibility in determining a significant effect based on the setting.

The potential cumulative impacts to forestry resources are discussed in Section 6.2.2-2 of the Draft EIR. As stated therein, in the past ten years, timber harvesting has been limited to vineyard conversion on 5 acres within the assessment area. The cumulative impact analysis found that:

> "The proposed timber harvest of 10.0± acres represents less than 0.015 percent of the total land in the watershed. Combined with the other known projects from the last decade, the total amount of timber converted is approximately 5 acres and is 0.0075 percent of the Bell Canyon Reservoir watershed. When added to the other known conversion projects in the watershed, this minor increase of less than 0.015 percent is less than significant to the watershed as a whole."

Refer to **General Response 20** regarding the adequacy of the cumulative analysis presented in the Draft EIR. Refer to **General Response 10** regarding fire risk and fire prevention for the Proposed Project.

Response to Comments A6-26 and A6-27

Vineyards and olive orchards are considered one of the best fire-resistant crops to provide a fuel break in Mediterranean climates (Keeley et. al, 2012). Therefore, the development of vineyards on the project site may provide a beneficial impact by protecting neighboring properties from wildfire. Although additional vineyard personnel would visit the property during the ongoing maintenance of the vineyard, pruning and harvesting activities are not considered to be high-risk wildfire activities. Land use changes and crop cover resulting from the Proposed Project will not significantly increase the risk of wildfire. Refer to **General Response 10** regarding fire risk and fire prevention for the Proposed Project.

Response to Comment A6-28

Refer to **Response to Comment A4-02** regarding the de-listing of the Napa River for nutrients and **General Response 6** regarding the use of stream setbacks as an appropriate and effective means of protecting water quality for both on- and off-site waters.

The Napa River Watershed Sediment TMDL and Habitat Enhancement Plan specifically states that an "effective means of reducing sediment delivery from sheetwash erosion would be for all vineyards to meet the performance standards specified under the Napa County Conservation Regulations (Chapter 18.108)" (Napolitano et. al, 2007). The Proposed Project is designed to comply with Chapter 18.108, and is therefore compliant with the Napa River Sediment TMDL. Refer to **General Response 5** regarding the reduction in erosion from the property in post-project conditions.

Response to Comment A6-29

Commenter disputes the calculation (found in Appendix N Water Demand and Water Availability Analysis by Napa Valley Vineyard Engineering, Inc) for estimated yearly groundwater infiltration from precipitation. Commenter cites the use of the Napa County Flood Control and Water Conservation District Isohyetal Rainfall Map 1975 as being outdated; however, this rainfall map matches the most recent data available from the Western Regional Climate Center (WRCC). According to the WRCC Angwin Pacific Union College US COOP Station Climate Summary which contains data from 1940 to 2015, annual precipitation is 40.67 inches (NVVE's calculation used 40 inches as the annual rainfall figure).

Considering this new figure, the new annual precipitation that would fall on the property would be 126.9 af (versus 125 af as stated in the Draft EIR):

37.43 acres (total property) x 40.67 inches = 126.9 acre feet (af)

Using more recent data as requested by the commenter actually increases the amount of water available for infiltration and further diminishes the Proposed Project's less-than-significant impact to groundwater supplies.

Response to Comment A6-30

Per Appendix E of the Draft EIR, the Hydrologic Analysis for the Proposed Project was completed by Matthew O'Connor, Certified Engineering Geologist of O'Connor Environmental Inc. The Hydrologic Analysis fully evaluated the altered flow conditions on the property in post-project conditions.

Response to Comment A6-31

Refer to **General Response 2** regarding the adequacy of the Draft EIR and **General Response 18** regarding the consistency analysis of the Proposed Project with relevant local policies. There is no Ponderosa Pine Forest on the property, as discussed in **Response to Comment A6-22**.

Response to Comment A6-32

An initial archeological survey of the property (Origer, 2013a) located a prehistoric site known as CA-NAP-1124, discussed further in Draft EIR Section 4.5.1-4. CA-NAP-1124 is a sparse scatter of obsidian debitage located within a proposed area of impact. As such, a further excavation study was conducted to determine the significance of CA-NAP-1124 which included field test pits, excavation of artifacts, and laboratory testing (Origer, 2013b).

Although the two cultural investigations discussed in the Draft EIR are confidential to protect non-renewable cultural resources pursuant to Section 304 of the National Historic Preservation Act (16 USC 470w-3) and the Archeological Resources Protection Act (16 USC Section 470h), the following excerpt from the excavation study supports the conclusions of Impact 4.5-1:

> "The site has yielded information important to understanding the prehistory of the region; therefore, the site is important pursuant to Criterion 4 of the California Register of Historical Resources. However, the paucity of formed artifacts and lack of features indicate that the site is unlikely to yield additional information that has not already been retrieved. CA-NAP-1124 meets criteria for classification as a sparse lithic scatter. The investigation described in this report constitutes mitigation of adverse impacts, and we see no reason why the location cannot be released for development."

In summary, CA-NAP-1124 is a sparse lithic scatter and its data potential has been met by Origer (2013b) through the excavations. No further mitigation for this site is necessary.

Refer to **General Response 18** regarding the consistency analysis of the Proposed Project with relevant local policies.

Response to Comment A6-33

The Napa County BDR identifies noise sensitive receptors as "places where people live, sleep, recreate, worship, and study" because intrusive noise can be disruptive to these activities (Napa County, 2005). Therefore, Section 4.11.2-3 of the Draft EIR identifies the nearest residence (located 1,000 feet south of the nearest vineyard block) as the closest sensitive receptor. The entrance to the Dunn-Wildlake Preserve located immediately adjacent to proposed vineyard Block A is the location of the hunting lodge (which is no longer used) and the parking lot for visitors. An abandoned building and a parking lot are not considered sensitive receptors by to CEQA or Napa County. Therefore, the use of the nearest residence as the sensitive receptor for the noise analysis is appropriate.

The use of construction equipment is discussed in Impact 4.11-1, including large equipment such as bulldozers, earth movers, and excavators. Although chainsaws are not explicitly listed in Table 4.11-6, they emit a noise level of approximately 120 dB at the source, which attenuates to a level of approximately 60 dB at 800 feet. This is significantly less than the County's noise threshold of 75 dB, Leq.

Although construction of the Proposed Project would generate noise typical of any construction project, with mitigation, construction of the Proposed Project would not expose persons to noise in excess of established standards established in the County General Plan or County Ordinance. Concerns related to County ordinances allowing excessive noise are beyond the scope of this EIR and the CEQA process. However, commenters can work with the County outside of the CEQA process to address these concerns. The THP also recognizes these noise concerns, and provides Mitigation #7 to reduce the use of loud equipment, increase safety of local roadways, and prevent inconvenience to local road users.

According to Napa County General Plan Policy CC-35 and Napa County Noise Ordinance 8.16.090, noises resulting from agricultural operations are considered a necessary part of the community character of Napa County and are exempt from standard non-agricultural noise regulation. Therefore, the Proposed Project's agricultural operations would be exempt under the Napa County municipal code. Additionally, given the agricultural nature of the Proposed Project, it would be consistent with land uses and noise sources in the vicinity and with the zoning of the project parcel and surrounding parcels. The operation of the Proposed Project would not interfere with Napa County General Plan policies or ordinance, and therefore this is a less-than-significant impact consistent with CEQA and CEQA *Guidelines*.

Response to Comment A6-34

Refer to **Response to Comment A6-32** regarding impacts to cultural resources.

Response to Comment A6-35

The Napa County Traffic Volume Summary utilized in the Draft EIR for Howell Mountain Road is the most updated information available from Napa County. The commenter is correct that the Traffic Volume Summary does not provide data for Friesen Drive, which is a largely private roadway as disclosed in Impact 4.12-1. Therefore, in the absence of published traffic counts, the Draft EIR estimated the peak day volumes on Friesen Drive at 354 vehicles using the following methodology:

> "The peak day volumes on Friesen Drive were estimated based on the number of property owners along the roadway, which is 37 in addition to the project property (adjacent landowners contacted for the THP, refer to Appendix H) and an assumption that each property would result in a maximum of 9.57 trips per day. These assumptions are conservative the trips per day value is typically applied to single-family residences (ITE, 2008) and not all property owners along Friesen Drive have residences on their properties. Further, some of the residences along Friesen Drive are vacation or seasonal homes."

Accordingly, the estimate of 354 peak day trips on Friesen Drive is a conservative estimate.

The commenter incorrectly states that the Draft EIR "never identifies when peak construction traffic is expected to occur," when Mitigation Measure 4.12-1 (THP Mitigation #7) states that "heavy equipment and material delivery and removal will be limited to non-peak hours (9 AM to 4 PM)." Please refer to page 4.12-7 of the Draft EIR.

As shown in Impact 4.12-2 of the Draft EIR, the maximum increase in vehicles on Friesen Drive and Howell Mountain Road during operation would be 26 one-way trips (13 in the AM and 13 in the PM), which would occur periodically during peak seasons such as pruning or harvest. These trips would occur during certain times of the year, when operations at the vineyard will increase. During other times of the year, operations (and operational traffic) will be less. The analysis of this impact has been clarified in **Section 4.0** of this Final EIR as follows:

> As discussed in **Section 4.12.1-2**, peak day volume on Friesen Drive is 354 trips (ITE, 2008) and the addition of 26 trips would increase the peak day volumes on Friesen Drive by 7.3 percent. However, given the capacity of Friesen Drive, the addition of 26 trips

would still be well below the assumed County maximum capacity of 1,000 vehicles per day for Friesen Drive.

Response to Comment A6-36

CEQA *Guidelines* § 15143 directs the EIR to focus on the significant effects to the environment. "Effects dismissed in an Initial Study as clearly insignificant and unlikely to occur need not be discussed further in the EIR." In accordance with CEQA *Guidelines* § 15143, energy impacts were discussed with emphasis in proportion to their severity and probability of occurrence. Given that energy impacts of the Proposed Project are largely temporary during the construction phase and the project does not proposed an energy consumptive land use (such as a housing subdivision or large building construction), the Draft EIR presented an appropriate level of scientific detail in accordance with CEQA *Guidelines*. Because the largest consumption of energy related to the Proposed Project will be during the construction phase, the EIR relies on Mitigation Measure 4.3-1 (THP Mitigation #5) which minimizes idling times to reduce the wasteful consumption of energy pursuant to CEQA § 21100 (b)(3). This measures is also required by CCR Title 13, Section 2485, which would ensure that large equipment or trucks used in project operations would be legally required to minimize idling times. These measures are also mirrored in the GHG analysis, which requires up-to-date equipment to reduce GHG emissions, as well as providing dual benefits by reducing energy use and noise.

Response to Comment A6-37

Section 5.0 of the Draft EIR presents two different alternatives to the Proposed Project: the No Project Alternative and the No Timber Conversion Alternative. One additional alternative, the Selective Long-Term Timber Harvest and Management Alternative, was eliminated from further consideration because it either did not reduce significant environmental effects of the Proposed Project or was not considered feasible, consistent with CEQA *Guidelines* § 15126.6. Refer to **General Response 19** regarding the adequacy of the alternatives analysis presented in the Draft EIR. Although a smaller vineyard footprint would have a slight reduction in the environmental impact areas noted by the commenter, it should be noted that mitigation measures have reduced all impacts to less-than-significant levels.

Response to Comment A6-38

The commenter asserts that the Draft EIR provides inconsistent conclusions regarding the environmentally superior alternative. However, the commenter failed to include the entire sentence quoted from the Draft EIR. "Overall, the No Timber Conversion Alternative would likely result in lesser direct impacts to the environment than the Proposed Project, but it would not result in any of the environmental benefits of the Proposed Project." These benefits of the Proposed Project include a reduction in erosion and sedimentation from the property (see

General Response 5) and providing a fire break for surrounding residences (**General Response 10**). The reduction in erosion comes from the planting of extensive cover crops required by the ECP, as well as the installation of other erosion control features such as water bars, attenuation basins, water spreaders, and rock stabilization. Given that areas outside of the project footprint on the property would remain in their current state, there would be no change to the rate of erosion coming from these areas. Therefore, the entirety of the sediment reduction must come from the areas subject to the erosion control features discussed above. A decrease in the total area that receives these improvements would mean more areas eroding at their current rates, and therefore a smaller ECP footprint would have less benefits to erosion from the property as a whole.

Response to Comment A6-39

As discussed in **General Response 20**, a two-step process was used in preparing the cumulative impact analysis in the Draft EIR, consistent with CEQA *Guidelines* § 15130. First, for each impact area, the impacts of the Proposed Project, in combination with those from other past, present, or reasonably foreseeable projects, were analyzed to assess whether they are cumulatively significant. Then, the effect of the Proposed Project was assessed to determine if it was a considerable contribution to that impact.

The geographic scope for the cumulative impact analysis presented in Section 6.2 of the Draft EIR included projects that meet the definition of cumulative as defined in CEQA *Guidelines* § 15355, which states that the incremental impact of the project should be added to "other closely related past, present, and reasonably foreseeable probable future projects." The cumulative analysis included all future "closely related" projects within a 3-mile radius for each impact area. Where appropriate, the cumulative environment was expanded to include additional potential impacts; for example the entire SFBAAB was included in the cumulative analysis for air quality. Refer to **General Response 20** regarding the cumulative analysis presented in the Draft EIR.

Response to Comment A6-40

Refer to **General Response 2** regarding the adequacy of the Draft EIR. Pursuant to CEQA *Guidelines* § 15088.5, a Draft EIR should be recirculated only if "significant new information is added to the EIR" after the public review period for the Draft EIR. No significant new information has been added to the EIR after public notice and review and, pursuant to CEQA *Guidelines* § 15088.5, CAL FIRE will not recirculate the Draft EIR as requested by the commenter.

Response to Comment A6-41

Refer to **Response to Comment A6-04** regarding the slopes on the property versus the project site and **General Response 18** regarding the consistency analysis of the Proposed Project with relevant local policies. Refer to **General Response 2** regarding the adequacy of the Draft EIR; as discussed in **Response to Comment A6-40** above, the Draft EIR will not be recirculated.

Letter A7 Mike Hackett, Chairman, Save Rural Angwin, October 4, 2015

Response to Comment A7-01

Refer to **General Response 4** regarding the project site's location near the Dunn-Wildlake Preserve, **General Response 2** regarding adequacy of the Draft EIR, **General Response 19** regarding the alternatives analysis, and **General Response 20** regarding the cumulative analysis within the Draft EIR.

Response to Comment A7-02

As shown in Impact 4.7-1, the operation of construction equipment, removal of timber, and tilling of soil would result in the emission of 3,032 MT of carbon dioxide equivalent (CO_2e) during the construction phase. Retention of timber as lumber results in the offset of 1,851 MT of CO_2e, a decrease of 61 percent from "business as usual" development. This 61 percent reduction is much greater than the 38 percent reduction required by the Napa County draft Climate Action Plan or by AB 32. Therefore, this is a less-than-significant impact. However, Mitigation Measure 4.7-1 (THP Mitigation #21) provides additional measures that would have a further beneficial reduction in GHG emissions. The "planting of native conifers and hardwood" discussed by the commenter is not required in the Draft EIR to reduce the Proposed Project's GHG emissions.

Response to Comment A7-03

Responses to the Quercus Group's comments are provided in **Letter A10** below.

Response to Comment A7-04

Impacts to oak woodland are discussed in Impact 4.4-1 and Mitigation Measure 4.4-1 (THP Mitigation #15). The Proposed Project shall remain in compliance with Napa County's Policy CON-24 regarding the 2:1 ratio of lost oak woodland replacement. See **General Response 12** for additional discussion of the HRA.

Response to Comment A7-05

Refer to **General Response 6** regarding pesticide use and **General Response 7** regarding water quality impacts to municipal suppliers. For responses to the City of St. Helena's specific comments, refer to **Letter A2** above.

Response to Comment A7-06

Refer to **General Response 4** regarding the project site's proximity to the Dunn-Wildlake Preserve. Refer to **Response to Comment A6-08** regarding the description of the hunting lodge on the Napa Land Trust property.

Response to Comment A7-07

Responses to the Land Trust's comments are provided in **Letter A6** above. Refer to **General Response 11** regarding the western pond turtle; **Response to Comment A6-10** and **Response to Comment A6-12** regarding nodding harmonia, tall snapdragon, and other plant species; **Response to Comment A6-13** regarding invasive species, and **Response to Comment A6-15** regarding NSO.

Response to Comment A7-08

The methods for reducing the overstory competition in the HRA enhancement areas will allow the existing oak seedlings to grow; using naturally-established oaks rather than replanting will also ensure higher success rates of mature oaks. A significant portion of the area slated for enhancement, particularly to the north and east of No Name Lake, were identified in 1993 aerial photography as oak woodland; in these areas, the enhancement activities will restore habitat that has been impacted by ongoing competition from the pine and chaparral habitat. Refer to **General Response 12** regarding the HRA and **Response to Comment A3-02** regarding the mechanism for long-term protection of the HRA; the reliance on Napa County Code Sections 18.108.027 for permanent protection is a sufficient "legally binding instrument" in accordance with CEQA *Guidelines* § 15126.4 (a) (2).

Response to Comment A7-09

Refer to **General Response 10** regarding fire risk and fire prevention for the Proposed Project.

Response to Comment A7-10

Refer to **Response to Comment A4-02** regarding the de-listing of the Napa River for nutrients and **General Response 6** regarding the use of stream setbacks as an appropriate and effective means of protecting water quality for both on- and off-site waters. Refer to **General Response 5** regarding the analysis of erosion and sedimentation.

Response to Comment A7-11

Refer to **General Response 18** regarding the consistency analysis of the Proposed Project with relevant local policies.

Response to Comment A7-12

Refer to **General Response 19** regarding the adequacy of the alternatives analysis presented in the Draft EIR.

Response to Comment A7-13

Refer to **General Response 2** regarding the adequacy of the Draft EIR and **General Response 20** regarding the adequacy of the cumulative analysis.

Letter A8 Daniel Zador, Planner II, Napa County Planning, Building, and Environmental Services Department, October 5, 2015

Response to Comment A8-01

Please refer to **General Response 22** regarding extension requests.

Letter A9 Nancy Tamarisk, Chair, Napa Sierra Club Executive Committee, Sierra Club, October 5, 2015

Response to Comment A9-01

Refer to **Response to Comment A1-03** regarding extension requests.

Response to Comment A9-02

Refer to **General Response 18** regarding the consistency analysis of the Proposed Project with relevant local policies and **General Response 14** regarding wildlife corridors and clustering vineyard development.

Response to Comment A9-03

As discussed in **Response to Comment A6-13**, Impacts to “native species” are not significant under CEQA provided that they are not special status as defined by CDFW, USFWS, or Napa County. In accordance with Appendix G of the CEQA *Guidelines*, the Draft EIR analyzes impacts to sensitive habitat (Impact 4.4-1), waters of the U.S. and riparian habitat (Impact 4.4-2), special status plants and animals (Impact 4.4-3 through 4.4-8), and wildlife movement (Impact 4.4-9). The potential impacts to those biological resources included the entirety of the Proposed Project as described in Section 3.4, including blasting, timber harvesting, and the use of agrichemicals. Black bears are not listed as a special status species, a species of concern,

or other protected species by CDFW. In fact, the population of black bears has doubled in California since 1982 (CDFW, 2016). As such, the Draft EIR appropriately acknowledged the probable presence of black bears near the project site (see page 4.4-21) and analyzed the overall wildlife movement impacts of the Proposed Project, but did not speculate as to the need for future depredation permits.

Response to Comment A9-04

As shown in Impact 4.7-1, the operation of construction equipment, removal of timber, and tilling of soil would result in the emission of 3,032 MT of carbon dioxide equivalent (CO_2e) during the construction phase. Retention of timber as lumber results in the offset of 1,851 MT of CO_2e, a decrease of 61 percent from "business as usual" development. This 61 percent reduction is much greater than the 38 percent reduction required by the Napa County draft Climate Action Plan or by AB 32. Therefore, this is a less-than-significant impact. However, Mitigation Measure 4.7-1 (THP Mitigation #21) provides additional measures that would have a further beneficial reduction in GHG emissions. The HRA discussed by the commenter is a mitigation measure for oak habitat impacts, not GHG emissions. Refer to **General Response 16** regarding the methodology used to estimate GHG emissions, which followed the most up to date methodology as required by BAAQMD and CARB. Responses to the Quercus Group's comments are provided in **Letter A10** below.

Although chaparral is not designated as a sensitive habitat and is a common biotic community in the County, CAL FIRE acknowledges that there is an inherent value to native habitat and unnecessary disturbance to these habitats should be minimized. As discussed above, no mechanical equipment is allowed in the HRA, except on the existing Friesen Drive, and all enhancement activities will be accomplished by hand with a chainsaw. It is unclear how the commenter has determined that the enhancement activities would "reduce the structural and compositional complexity of the habitat," when the activities are specifically designed to increase the complexity of the habitat. Girdling of the pines will create snag habitat which is presently lacking in some areas, and the manzanita will be left in-place to provide habitat for birds and animals. Refer to **General Response 12** regarding the use of the HRA as an appropriate mitigation measure in accordance with CEQA *Guidelines* § 15126.4.

Response to Comment A9-05

Refer to **Response to Comment A6-10** and **Response to Comment A6-12** regarding the special status plant surveys conducted for the Proposed Project.

Response to Comment A9-06

Refer to **General Response 11** regarding the western pond turtle, including the current petition for listing being evaluated by the USFWS.

Response to Comment A9-07

Refer to **Response to Comment A6-05** for a discussion of blasting. Pursuant to the Biological Resources Report and Section 4.4.4 of the Draft EIR, there are no sensitive rock outcrops on the project site.

Response to Comment A9-08

Refer to **General Response 19** regarding the adequacy of the alternatives analysis presented in the Draft EIR.

Response to Comment A9-09

Refer to **General Response 20** regarding the adequacy of the cumulative analysis in the Draft EIR.

In accordance with CEQA *Guidelines* § 15126.2, the potential for growth inducement attributable to the Proposed Project is discussed in Section 6.1 of the Draft EIR. As discussed throughout the Draft EIR, Friesen Drive is an existing road that provides access to both project parcels. The Proposed Project would not provide new access to any parcels that would constitute the removal of an "obstacle to population growth" as defined by CEQA *Guidelines* § 15126.2 (d). Given that the Proposed Project would not provide new access to any parcels in the project site vicinity, it is not reasonably foreseeable that the project would induce new vineyard development or growth.

Response to Comment A9-10

Refer to **General Response 2** regarding adequacy of the Draft EIR.

Letter A10 Ron Cowan, Principal, Quercus Group, October 5, 2015

Response to Comment A10-01

Comment noted. Refer to **Response to Comment A4-12**, **General Response 16**, and Section 4.7 of the Draft EIR regarding biogenic carbon sequestration. In addition, it should be noted that the commenter appears to misunderstand the statutory requirements that guide the environmental review of the THP versus the EIR. As stated on pages 1-1 and 3-5 of the Draft EIR, the THP is prepared concurrently with the Draft EIR by CAL FIRE under a CEQA-equivalent process guided by the Forest Practice Rules. The EIR is prepared in accordance

with CEQA and the CEQA *Guidelines*. Therefore, it is inappropriate for the commenter to compare the contents of the THP to the requirements of CEQA, as CEQA does not guide the preparation, contents, or noticing procedures of the THP.

Response to Comment A10-02

Comment noted, direct and indirect biogenic GHG emissions occur when forest resources are harvested; refer to page 4.7-6 of the Draft EIR for additional discussion. The commenter incorrectly states that indirect and direct biomass carbon emission is required in accordance with the BAAQMD CEQA Guidelines. As discussed in Section 4.7.3-1,

> "Although the Guidelines provide clear guidance on how to analyze GHG emissions from biogenic sources, which result from natural biological processes such as the decomposition or combustion of vegetative matter (wood, paper, vegetable oils, animal fat, yard waste, etc.), the Guidelines do not require the quantification of biogenic emissions as part of the quantification of GHG emissions for projects and does not provide a GHG emission threshold for these sources for both operation and construction activities. However, the Guidelines do recommend that construction-related GHG emissions be quantified using the CalEEMod 2013.2 air quality program California Emissions Estimator Model (CalEEMod) and disclosed in the appropriate environmental document. The Guidelines require that only exhaust from construction equipment be included in the climate change analysis, similar to the analysis for criteria pollutants."

As such, the GHG emissions analysis was appropriately conducted in accordance with BAAQMD CEQA Guidelines.

Response to Comment A10-03

As stated in Section 4.7.1-3 and in **Response to Comment A10-02**, indirect biogenic GHG emissions are not required to be quantified under the methodology used to estimate project related GHG emissions. However, as shown in Table 4.7-1 and Table 4.7-2, GHG emissions from timber removal, soil tilling/ground clearing, and loss of sequestration have been quantified. The methodology used to quantify these GHG emissions were from the BAAQMD CEQA Guidelines. For a list of the inputs that were used to generate the CalEEMod model results, refer to Appendix C of the Draft EIR.

Governor's Executive Order (EO) S-3-05 was signed on June 1, 2005, and has been superseded by more recent senate bills (SBs), EOs, and legislation regarding climate change, including: EO S-01-07; EO B-16-12; EO B-18-12; EO B-30-15; AB 32; SB 97; and SB 375. Refer to Section 4.7.2 of the Draft EIR for a discussion of the key relevant laws and orders. By meeting the goals of the draft Napa County Climate Action Plan and AB 32, the Proposed

Project will meet the most recent targets for GHG emission reductions. Refer to Impact 4.7-1 and Impact 4.7-2 of the Draft EIR. Refer to **General Response 16** regarding the discussion of climate change presented in the Draft EIR.

Response to Comment A10-04

The impact analysis presented in the Draft EIR was prepared in accordance with the recommendations of CEQA *Guidelines* § 15064.4 ("Determining the Significance of Impacts from Greenhouse Gas Emissions"). This section contains numerous requirements, including using a model or methodology to quantify GHG emissions, and comparing the project emissions to "a threshold of significance that the lead agency determines applies to the project."

As discussed in Section 4.7.2 of the Draft EIR, the BAAQMD CEQA Guidelines

> "In June 2010, the Bay Area Air Quality Management District's (BAAQMD) Governing Board adopted new CEQA Guidelines (Guidelines), which provide guidance for analyzing project-level climate change impacts. The Guidelines provide GHG emissions thresholds for project operation; however, the Guidelines do not provide project construction GHG emission thresholds. On March 5, 2012 the Alameda County Superior Court issued a judgment finding that the BAAQMD had failed to comply with CEQA when it adopted the thresholds provided in its CEQA Guidelines. The court did not determine whether the thresholds were valid on the merits. The court set aside the thresholds and ceases dissemination of them until the BAAQMD complies with CEQA. The BAAQMD has appealed the Alameda County Superior Court's decision. On August 13, 2013 the Court of Appeal of the State of California, First Appellate District, held that establishing thresholds of significance is not a "project" subject to its own CEQA review and found in favor of the BAAQMD."

As such, use of the BAAQMD CEQA Guidelines is an appropriate and reasonable threshold based on science, fact, and law.

Response to Comment A10-05

Mitigation Measure 4.7-1 and THP Mitigation #21 do not require the purchasing of carbon credits to reduce impacts. In accordance with CEQA *Guidelines* § 15126.4 (c), Mitigation Measure 4.7-1 (THP Mitigation #21) presents several legally binding and enforceable measures that would reduce GHG emissions. THP page 139 will be updated for consistency with the aforementioned mitigation measures.

Nothing in EO S-3-05 mandates that a project "must mitigate 80 percent of forest land conversion;" refer to **Response to Comment A10-03** regarding the applicability of EO S-3-05.

The Proposed Project is in compliance with the most recent laws and guidelines regarding GHG emission reduction.

Response to Comment A10-06

Refer to **General Response 16** regarding the adequacy of the climate change discussion presented in the Draft EIR and THP.

Letter A11 Dr. John W. Cruz, Logging Review Program Manager, Forest Unlimited, October 5, 2015

Response to Comment A11-01

Comment noted. As discussed in Section 3.4.3-2 and Section 4.9.1-4 of the Draft EIR, creation of new on-site wells is not a part of the Proposed Project. There are two existing on-site wells, only one of which would be used for irrigation water.

Response to Comment A11-02

Refer to **General Response 10** regarding fire risk and fire prevention for the Proposed Project.

Response to Comment A11-03

The Draft EIR and THP present detailed analysis of the Proposed Project's potential impacts to climate change in accordance with CEQA *Guidelines* § 15064.4; refer to Section 4.7 (page 4.7-1) of the Draft EIR and pages 84 and 138 of the THP.

Refer to **Response to Comment A10-04** and **Response to Comment A10-05** regarding the analysis of GHG emissions and the mitigation measures presented in the Draft EIR, respectively. By exceeding the GHG reduction goals of the draft Napa County Climate Action Plan and AB 32, the Proposed Project will meet the most recent targets for GHG emission reductions. Refer to Impact 4.7-1 and Impact 4.7-2 of the Draft EIR. Refer to **General Response 16** regarding the discussion of climate change presented in the Draft EIR.

As stated in the Draft EIR (Impact 4.7-1) and THP (THP Mitigation #21), the Proposed Project would retain timber in the form of lumber, which would result in a decrease in carbon emissions of 61 percent from "business as usual" practices. Therefore, no purchasing of carbon credits is required to offset GHG emissions; this has been clarified on page 139 of the THP.

The commenter provides a link to a California Board of Forestry document that is inactive; as such, no further response can be provided.

Response to Comment A11-04

Refer to **General Response 5** for additional discussion regarding erosion and sedimentation. Napa County procedures for vineyard development specify that the USLE, as adapted for vineyards, be used to estimate soil loss from a proposed vineyard. According to the USLE analysis for pre- and post-project sediment runoff, there is a net decrease in sediment runoff from the project site. Under current conditions, the 13.6± acre project site produces a total of 20.9 tons per year of eroded sediment (OEI, 2014). After implementation of the erosion control measures in the ECP, the USLE predicts the Proposed Project will produce 15.1 tons per year, representing an approximately 25 percent decrease in sedimentation over baseline conditions. This exceeds the requirements of and thus is in compliance with the Napa County General Plan Policy CON-48, which requires project-specific sediment management plans which, at a minimum, maintain pre-development sediment erosion conditions.

Response to Comment A11-05

The Proposed Project would result in a net decrease in sediment leaving the property, which would have a beneficial impact to water quality in downstream spawning habitat. Refer to **General Response 5** regarding erosion and sedimentation.

Response to Comment A11-06

Operation of the proposed vineyard would utilize IPM techniques in order to minimize the use of pesticides and herbicides to the maximum extent feasible. Following the IPM Plan will ensure that any impacts due to agrichemicals are reduced through proper use, storage, and minimization measures. However, additional mitigation measures have been included in the Draft EIR to safeguard against the inherent risk of hazardous materials incidents in all vineyard development and operation practices found throughout Napa County. Refer to **General Response 6** for further discussion of pesticide use.

Response to Comment A11-07

Refer to **General Response 10** regarding fire risk and fire prevention for the Proposed Project.

Response to Comment A11-08

Section III of the THP (beginning on page 86) provides additional support documentation and analysis to support the conclusions of the THP. Specific landowner commitments and mitigation measures are presented Sections I and II.

Response to Comment A11-09

Commenter appears to misunderstand or misinterpret the alternatives analysis presented in the THP. Six different alternatives to the Proposed Project are considered on pages 94 through 96.

Response to Comment A11-10

The requested alternative ("No Timber Conversion Alternative") is analyzed in Section 5.3.2 of the Draft EIR. Refer to pages 5-3 through 5-6. Refer to **General Response 19** regarding the adequacy of the alternatives analysis presented in the Draft EIR.

Response to Comment A11-11

The impacts of both construction traffic (including timber felling and lumber hauling) and traffic due to the operation of the proposed vineyard are analyzed in Impact 4.12-1 and Impact 4.12-2, respectively.

Response to Comment A11-12

There is no evidence that the proposed conversion would fail, as there are established vineyards in the County and in the project site vicinity that produce high-quality wine grapes and the acreage to be converted has been selected because of favorable topography, soils, and climate. See page 10 of the TCP (Appendix I to the Draft EIR). The commenter is correct that CAL FIRE requires assurance that if the conversion were to fail, the land would be replanted to timber. No additional detail is required beyond that at this time, as the failure of the vineyard is not a reasonably foreseeable consequence of the Proposed Project.

Response to Comment A11-13

Refer to **General Response 14** regarding habitat fragmentation and wildlife corridors. As stated in Section 3.4.3-1 of the Draft EIR:

> "Wildlife exclusion fencing is proposed to be installed to encompass the vineyard blocks with exit doors (gates) and/or cattle guards for safe removal of trapped wildlife. The existing barbed wire fence along the west boundary of the property will remain in place, with the possible exception of areas adjacent to proposed vineyard blocks which may be replaced with wildlife exclusion fencing. As summarized in the Biological Resources Report, no significant wildlife corridors would be impacted by the Proposed Project (refer to Section 4.5; Appendix D)."

Response to Comment A11-14

Though adjacent to the Dunn-Wildlake Preserve, the subject property has never been owned by the Napa Land Trust and is therefore unrelated to the recreational value of the Land Trust property. Per page 141 of the THP:

> "Hunting, hiking, cycling and camping are the anticipated recreational activities, which exist within the assessment area. These activities are controlled by and limited to the landowner to his property only. These activities are not expected to change. The landowner controls the private use of his property, trespassing is not allowed. Several adjacent landowners are in the process of negotiations to install a permanent gate near the back of Friesen drive to reduce traffic related to trespassing. This gate will be maintained by this landowner and adjacent owners. Adjacent property owners have also posted their property prohibiting trespass. Due the location size and restrictive control of this property this conversion is not expected to have a significant adverse impact on the recreation activity within the assessment area. The general public cannot access this property; no public road system goes through or is adjacent to the assessment area. No significant adverse impacts are expected to occur."

Response to Comment A11-15

Please refer to **Response to Comment A11-01** regarding development of new wells on the property. There is an existing reservoir on-site that is maintained by the Howell Mountain Mutual Water Company; however, this reservoir will not be a water source for the proposed vineyard.

Response to Comment A11-16

The commenter asserts that the Draft EIR did not take into account initial vine establishment when calculating water usage. However, in Section 4.9.1-4, calculations of projected groundwater usage for the vineyard are made, including those of initial vines. Per the Draft EIR, "The vineyard requires approximately 6 acre-feet of water per year during the establishment period when the grape vines are young, which represents 30 percent of the parcel's allowable groundwater limit and is still less than the recharge rate from annual precipitation on the property." Refer to **General Response 8** regarding groundwater use, availability, allowances, and recharge rates.

Response to Comment A11-17

Page 53 of the TCP referenced by the commenter also refers to the IPM Plan (Appendix J to the Draft EIR). The IPM Plan is part of the project as proposed to CAL FIRE, and as such is a legally binding commitment of the landowner. Therefore, the IPM Plan is an enforceable

measure and compliance would compelled by the MMRP or findings document that is adopted by the CEQA Lead Agency. As the Lead Agency, CAL FIRE will ensure that mitigation measures are implemented and will serve as a point of contact for the public. Therefore, there are legally binding and enforceable measures to ensure the applicant will comply with the mitigation measures in the EIR, including the rules for safe pesticide and fertilizer application.

Response to Comment A11-18

Refer to **General Response 8** regarding groundwater use, availability, allowances, and recharge rates. The project applicant will abide by all laws and local ordinances, and will report water use to the County or CAL FIRE if this is a required condition of project approval.

Response to Comment A11-19

Commenter does not provide the entire quote from the IPM Plan regarding the use of herbicides. The entire discussion provided in the IPM Plan states that "we will not be using any herbicides that have any known residual activity, pre-emergent or otherwise." Refer to **General Response 6** regarding pesticide use and **General Response 7** regarding water quality impacts to municipal suppliers.

Response to Comment A11-20

Comment noted. No such "open rangeland" exists on the property as shown in Figure 4.4-1 of the Draft EIR.

Response to Comment A11-21

The Water Demand and Availability Analysis presented in Appendix O of the THP (or Appendix N of the Draft EIR) was prepared on January 14, 2014 and utilized a project layout that anticipated approximately 10.22 acres of vineyard with a vine density of 1,556 vines per acre. Since this analysis was completed, the project ECP underwent several revisions and updates as required by Napa County RCD, and the final ECP (dated August 18, 2015) estimated 3.3 afa long-term water use. This number is used throughout the THP and Draft EIR, and represents the most up-to-date water use figure.

Letter A12 Daniel Zador, Planner II, Napa County Planning, Building, & Environmental Services Department, October 8, 2015

Response to Comment A12-01

Refer to **General Response 18** regarding the consistency analysis of the Proposed Project with relevant local policies. The commenter notes that additional information was requested in November 2013 regarding the project's impacts to biological resources. In response to this

request, a site visit was held and mitigation measures were formulated (including the HRA) in consultation with Napa County.

Refer to **Response to Comment A6-22** regarding the lack of ponderosa pine forest on the property. The Napa County BDR and the Draft EIR (page 4.4-20) acknowledge that Ponderosa pine may be co-dominant within a Douglas Fir Forest but that it should still be classified as a Douglas Fir Forest; the presence of some Ponderosa pine trees does not make the habitat type a Ponderosa Pine Forest that is considered sensitive by Napa County. As designated by the Manual of California Vegetation, a Ponderosa Pine Forest is one that is "sole, dominant, or important" in the overstory (Sawyer et al., 2009). Although Ponderosa pines occur on the property, there are no habitats that can be designated as Ponderosa Pine Forests on the property.

As discussed further in **General Response 12**, Mitigation Measure 4.4-1 (THP Mitigation #15) reduces impacts to oak woodlands to less-than-significant levels in accordance with CEQA *Guidelines* § 15126.4 and Napa County General Plan Policy CON-24. The HRA would contain 13.1 acres, which exceeds the 2:1 ratio of mitigated versus impacted oaks required by the General Plan Policy CON-24.

Refer to **General Response 13** regarding impacts to Napa lomatium. The seed bank retention strategy required by Mitigation Measure 4.4-3 (THP Mitigation #20) was developed after the County suggested that a seed retention plan be implemented during the scoping period (Appendix A of the Draft EIR). Given that the Proposed Project would have an adverse impact on at least a portion of identified Napa lomatium areas and corresponding seed bank, a seed retention plan is required in Mitigation Measure 4.4-3 to (THP Mitigation #20) ensure that impacts to Napa lomatium are less than significant.

Given that suitable habitat for western pond turtle is directly adjacent to No Name Lake, it is highly unlikely that any western pond turtles would traverse across Friesen Drive to enter the project site, which does not contain appropriate soils for estivation. This discussion regarding the lack of suitable habitat within the vineyard blocks has been added to Impact 4.4-7 of this Final EIR. Although the impacts to western pond turtle are less than significant, additional mitigation has been added to this Final EIR requiring orange construction fencing to be place along the east side of Friesen Drive to ensure that construction equipment or workers do not disturb western pond turtle habitat. Refer to **General Response 11** for more details regarding impacts to the western pond turtle.

As discussed in **General Response 14**, **Figure 3-2** has been prepared in response to comments received on the Draft EIR to show a zoomed out view of the HRA in relation to the

existing open space surrounding it. Therefore, the HRA will minimize impacts to wildlife corridors and minimize habitat fragmentation within the overall context of the site and vicinity.

Response to Comment A12-02

The commenter correctly cites General Plan Policy CON-24, which is cited in its entirety on pages 4.4-10 through 4.4-11 of the Draft EIR and analyzed in Impact 4.4-1. The project as proposed would conflict with this policy, and therefore Mitigation Measure 4.4-1 (THP Mitigation #15) is provided to ensure the Proposed Project is consistent with General Plan Policy CON-24. Refer to **General Response 12** regarding the use of the HRA as an appropriate mitigation.

Both the Lead Agency (CAL FIRE) and the Responsible Agency (Napa County) in the course of adoption of the Proposed Project, must make a determination under CEQA for any impact that was not fully mitigated. All impacts of the Proposed Project have been mitigated to less-than-significant levels. The decision making body will evaluate all information in the administrative record and will ultimately render a decision on infeasibility per the General Plan prior to making a decision on the proposed ECP.

The commenter requests a specific alternative be analyzed in the EIR that removes Block A, portions of Block C, the area between Blocks A and B, and the area between Blocks C and D. This alternative would remove a large percentage of the already small (10.5 net acre vineyard), and would render portions of some blocks unfarmable from an agricultural standpoint. This would also remove areas slated for important erosion control features such as rolling dips and rock checks (refer to Figure 3-4 of the Draft EIR). As such, this alternative does not meet one of the fundamental goals of the Proposed Project, which is to: “Develop 10.5± net acres of vineyard on the portions of the property that are suitable for the cultivation of high-quality wine grapes while ensuring the economic viability of the Proposed Project” (Section 3.3). Refer to **General Response 19** regarding the adequacy of the alternatives analysis presented in the Draft EIR.

Response to Comment A12-03

Refer to **Response to Comment A6-19** regarding the removal of chaparral habitat for the proposed HRA enhancement activities and **General Response 12** regarding the use of the HRA as an appropriate mitigation measure in accordance with CEQA *Guidelines* § 15126.4.

It should be noted that the areas chosen for the oak enhancement areas in the HRA are those areas that were previously mapped as oak woodland by Napa County (ICE, 2013). Due to plant succession, the oak trees have been gradually out-competed over time by pines and chaparral. The intention of the HRA is to facilitate the return of the habitat to the County’s oak classification. The girdling of pines and selective cutting of manzanita or chamise will be done

on a site-specific basis as directed by a registered professional forester or qualified biologist at the time of implementation of the HRA. Each individual case will evaluated by the forester to promote the health of the habitat and the enhancement of oak succession (i.e. if a pine tree does not have oak seedlings in the understory, that oak will be left in-place to provide habitat diversity).

The Biological Resources Report cited by the commenter (Appendix D of the Draft EIR) was conducted by Kjeldsen Biological Consulting in March 2015. This initial biological report did not recommend any specific enhancement measures to mitigate for impacts to oak habitat. The biologists who assessed the Proposed Project during the preparation of the Draft EIR determined that impacts to oak woodland would be potentially significant, and therefore provided Mitigation Measure 4.4-1 (THP Mitigation #15) in the Draft EIR (published August 2015) to provide a more conservative assessment for habitat impacts. Therefore, the Appendix D preliminary recommendations for biological resources were utilized and augmented by the analysis presented in Section 4.4 of the Draft EIR. Refer to **Response to Comment A6-20** regarding the prohibition of mechanical equipment within the HRA to protect water quality.

Response to Comment A12-04

The Proposed Project is in compliance with Napa County Code 18.108.025 through its design and mitigation measures. All project activities are set back from the on-site USGS blue line streams and Class III water course by buffer zones ranging from 55 to 125 feet, consistent with Napa County ordinance and Forest Practice Rules, and no activities would take place within these setbacks. As discussed in Impact 4.2-2 of the Draft EIR, the proposed "setback distances were determined by the Forest Practice Rules and Napa County Ordinance, which ever was larger." The Napa County Code of Ordinances are the legally binding laws of the County, whereas the General Plan is a guidance document. As discussed in the Introduction to the Napa County General Plan:

> "This General Plan serves as a broad framework for planning the future of Napa County. This General Plan is the *official policy statement* of the County Board of Supervisors to guide the private and public development of the County.
>
> *State law requires that the County's ordinances regulating land use be consistent with the General Plan.* The Zoning Code, individual project proposals, and other related plans and ordinances must be consistent with the goals and policies in this General Plan" (*emphasis added*).

The "heads of drainages" as described in Policy CON-24(a) and by the commenter is an inherently vague term that is not delineated in the General Plan, local ordinances, or in scientific

literature. Although it is clear that the Proposed Project is located near the top of the watershed, it is unclear how the 55 to 125 foot setbacks are encroaching on the "heads of drainages." Because the Proposed Project was designed to be in compliance with Napa County Code 18.108.025, no further setbacks are required. Concerns related to County ordinances and perceived inconsistency with the General Plan are beyond the scope of this project-level EIR and the CEQA process.

Response to Comment A12-05

The commenter correctly cites General Plan Policy CON-18, which is cited in its entirety on pages 4.4-8 through 4.4-9 of the Draft EIR and analyzed in Impact 4.4-9. Impacts to western pond turtle are analyzed in Impact 4.4-8; refer to **General Response 11** for additional discussion on the western pond turtle. The western pond turtle is a habitat generalist and will traverse terrain until suitable habitat for nesting and overwintering is reached. Given that suitable habitat is directly adjacent to No Name Lake, it is highly unlikely that any western pond turtles would traverse across Friesen Drive to enter the project site, which does not contain appropriate soils for estivation. This discussion regarding the lack of suitable habitat within the vineyard blocks has been added to Impact 4.4-7 of this Final EIR. Although the impacts to western pond turtle are less than significant, additional mitigation has been added to this Final EIR requiring orange construction fencing to be place along the east side of Friesen Drive to ensure that construction equipment or workers do not disturb western pond turtle habitat.

The commenter requests "protocol surveys" be conducted for WPT. However, no such protocols exist for WPT from either CDFW or USFWS. In addition, the presence of the WPT was confirmed in No Name Lake during the biological site surveys, so additional surveys would not be useful since presence of western pond turtle is already confirmed.

As discussed in **General Response 7**, there is no direct connection between the project site and either of the nearby reservoirs (No Name Lake on the property and Wild Lake on the adjacent Land Trust Property). There is similarly no direct hydrologic connection between these two reservoirs. The fencing that is now proposed in Mitigation Measure 4.4-7 would ensure that western pond turtles would not wander onto Friesen Drive (which is the most direct route between No Name Lake and Wild Lake). Furthermore, as noted by the commenter, the two ponds are over 1,400 feet apart, which is a greater distance than the largest known distance that WPT has ever traveled from water for nesting (Jennings and Hayes, 1994); refer to **General Response 11**.

Response to Comment A12-06

The commenter correctly cites General Plan Policy CON-18, which is cited in its entirety on pages 4.4-8 through 4.4-9 of the Draft EIR and analyzed in Impact 4.4-9.

Refer to **Response to Comment A9-03** regarding the consideration of black bears in the Draft EIR. Black bears are not listed as a special status species, a species of concern, or other protected species by CDFW. In fact, the population of black bears has doubled in California since 1982 (CDFW, 2016). As such, the Draft EIR appropriately acknowledged the probable presence of black bears near the project site (see page 4.4-21) and analyzed the overall wildlife movement impacts of the Proposed Project.

Refer to **General Response 14** regarding habitat fragmentation and wildlife corridors. A new figure (**Figure 3-1**) has been created for this Final EIR to show the HRA in relation to the surrounding open space habitat. As shown therein, the HRA is connected to wildlife corridors off of the property.

Refer to **General Response 18** regarding the consistency analysis of the Proposed Project with relevant local policies.

Response to Comment A12-07

The commenter correctly cites General Plan Policies CON-6, CON-50, and CON-53, which are cited in their entirety on pages 4.4-11 and 4.9-11 through 4.9-12 of the Draft EIR and analyzed in Impact 4.4-2, Impact 4.9-1, Impact 4.9-2, Impact 4.9-4, and Impact 4.9-5.

As discussed further in **General Response 8**, there are two existing wells on the property, and no new wells are proposed. Well No. 2 located within Block C is proposed as the primary source of irrigation water for the proposed vineyard. Well No. 2 is capable of sustaining a yield of approximately 50 gallons per minute (gpm), as discussed on page 3-13 of the Draft EIR. The well is supported by groundwater located in the fractured Sonoma Volcanics underlying the project site; the well is sufficiently deep (perforations begin 280 feet below ground surface) and set back from surface water to avoid pumping any surface or subsurface flow. As discussed in Section 3.4.3-2 and Section 4.9.1-4 of the Draft EIR, creation of new on-site wells is not a part of the Proposed Project. There are two existing on-site wells, only one of which would be used for irrigation water. The existing well (Well No. 1) mentioned by the commenter that is located near No Name Lake will not be used for irrigation supply. Given that the well proposed for use (Well No. 2) does not pump surface or subsurface water, there is no potential for reservoir drawdown that could impact western pond turtle.

Response to Comment A12-08

The commenter correctly cites General Plan Policy CON-17, which is cited in its entirety on page 4.4-8 of the Draft EIR and analyzed in Impact 4.4-3. Refer to **General Response 13** regarding the mitigation for Napa lomatium, which was developed after consultation with Napa

County. There is sufficient area around No Name Lake that would provide suitable habitat for the Napa lomatium seed bank transfer, and a qualified biologist or botanist would identify this area prior to the seed bank transfer (as identified in Mitigation Measure 4.4-3 and THP Mitigation #20). As discussed further in **General Response 13**, long-term monitoring of the Napa lomatium mitigation has been added to the Final EIR.

Response to Comment A12-09

As discussed further in **General Response 19**, the Draft EIR appropriately considered a reasonable range of alternatives that were determined with a consideration for each alternative's ability to meet the purpose and need while also reducing environmental impacts. The discussion in Section 5.4 of the Draft EIR provides the reasoning as to why some alternatives were not further considered in accordance with CEQA *Guidelines* § 15126.6(b), which states that "the discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project." In addition, the THP considered six different alternatives to the timber harvest, as discussed on pages 94 through 97.

Refer to **General Response 12** and **Response to Comment A3-02** regarding the mechanism for long-term protection of the HRA; the reliance on Napa County Code Sections 18.108.027 for permanent protection is a sufficient "legally binding instrument" in accordance with CEQA *Guidelines* § 15126.4 (a) (2).

In accordance with CEQA *Guidelines* § 15126.2, the potential for growth inducement attributable to the Proposed Project is discussed in Section 6.1 of the Draft EIR. As discussed throughout the Draft EIR, Friesen Drive is an existing road that provides access to both project parcels. Given that there are no plans or proposals to develop "multiple single family residences, [or] accessory buildings", there is no evidence before CAL FIRE that the Proposed Project would induce growth as claimed by the commenter. The Proposed Project would not provide new access to any parcels that would constitute the removal of an "obstacle to population growth" as defined by CEQA *Guidelines* § 15126.2 (d). Given that the Proposed Project would not provide new access to any parcels in the project site vicinity, it is not reasonably foreseeable that the project would induce new vineyard development or growth.

Refer to **General Response 19** regarding the adequacy of the alternatives analysis presented in the Draft EIR.

Response to Comment A12-10

Refer to **General Response 19** regarding the adequacy of the alternatives analysis presented in the Draft EIR. Although a smaller vineyard footprint would have a slight reduction in the

environmental impact areas noted by the commenter, it should be noted that mitigation measures have reduced all impacts to less-than-significant levels.

Furthermore, there are environmental benefits to the Proposed Project that would not be realized by any of the project alternatives. As discussed further in **Response to Comment A6-38**, a smaller vineyard footprint would lead to a lesser reduction in sediment leaving the property. The reduction in erosion comes from the planting of extensive cover crops required by the ECP, as well as the installation of other erosion control features such as water bars, attenuation basins, water spreaders, and rock stabilization. Given that areas outside of the project footprint on the property would remain in their current state, there would be no change to the rate of erosion coming from these areas. Therefore, the entirety of the sediment reduction must come from the areas subject to the erosion control features discussed above. A decrease in the total area that receives these improvements would mean more areas eroding at their current rates, and therefore a smaller ECP footprint would have less benefits to erosion from the property as a whole.

As discussed in **Response to Comment A12-03**, the areas chosen for the oak enhancement in the HRA are those areas that were previously mapped as oak woodland by Napa County. Due to plant succession, the oak trees have been gradually out-competed over time by pines and chaparral. The intention of the HRA is to facilitate the return of the habitat to the County's oak classification. The girdling of pines and selective cutting of manzanita or chamise will be done on a site-specific basis as directed by a registered professional forester or qualified biologist at the time of implementation of the HRA. Each individual case will evaluated by the forester to promote the health of the habitat and the enhancement of oak succession (i.e. if a pine tree does not have oak seedlings in the understory, that oak will be left in-place to provide habitat diversity). This will provide a benefit to the oak woodland habitat on the property, contrary to the commenter's assertion.

Response to Comment A12-11

As stated throughout the Draft EIR, the EIR was prepared to analyze both CAL FIRE and County of Napa rules and regulations, in order to facilitate the decision on the project that both agencies must ultimately make. As discussed in Section 1.0:

> "The timber conversion is evaluated in this Draft EIR to facilitate the consideration by CAL FIRE of a Timberland Conversion Permit (TCP) application. Additionally, the County of Napa (County) must consider an Erosion Control Plan (ECP) for the planting of the vineyard to finalize the conversion from timberland to agricultural use. Napa County is therefore a Responsible Agency and will use this Draft EIR in evaluating its decision on the ECP."

Refer to **General Response 18** regarding the consistency analysis of the Proposed Project with relevant local policies. Refer to **General Response 2** regarding the adequacy of the Draft EIR.

Letter A13 Dr. John W. Cruz, Logging Review Program Manager, Forest Unlimited, November 9, 2015

Response to Comment A13-01

The Forest Practice Rules (14 CCR 1037.5) regulate the role, composition, and duties of the THP review team. The function of the Review Team is to assist the Director in "determining if plans are in conformance with Board rules and to evaluate the potential environmental impacts of timber operations" (1037.5 (b)). The Review Team has thus far acted in accordance with the requirements of Section 1037.5, including:

> "(g) (1) *Before the Director accepts a plan for filing* or before the fifth working day after filing, a review team shall review the plan.
> (g) (2) After the preharvest inspection and before the Director's determination on a plan, the review team shall meet to review all the information on the plan and develop a recommendation for the Director." (*emphasis* added)

The Friesen THP (File Number 1-15-081 NAP) was accepted by Review Team for filing on July 31, 2015. The PHI occurred on August 25, 2015, and the second Review Team meeting occurred on October 29, 2015. In accordance with Section 1037.5, the public comment period remained open 10 days after the close of the Second Review (November 9, 2015), and CAL FIRE began responding to comments. The Review Team has found the Davis Friesen THP to be in conformance with the Forest Practice Rules, but it is not responsible for approving the plan; the Director has this responsibility. All public comments are considered by the Director, along with the recommendations of the Review Team, prior to making a decision on the THP.

Letter A14 Mike Hackett, Bell Canyon Watershed Alliance, November 9, 2015.

Response to Comment A14-01

Comment noted. As discussed in **Response to Comment A10-01**, separate statutory requirements guide the environmental review of the THP versus the EIR. As stated on pages 1-1 and 3-5 of the Draft EIR, the THP is prepared concurrently with the Draft EIR by CAL FIRE under a CEQA-equivalent process guided by the Forest Practice Rules. The EIR is prepared in accordance with CEQA and the CEQA *Guidelines*. Therefore, it is inappropriate for the commenter to compare the contents of the THP to the requirements of CEQA, as CEQA does not guide the preparation, contents, or noticing procedures of the THP. CEQA *Guidelines* § 15090 (a) requires that, prior to approving a project, the Lead Agency shall certify that:

(1) The final EIR has been completed in compliance with CEQA;
(2) The final EIR was presented to the decision-making body of the lead agency, and that the decision-making body reviewed and considered the information contained in the final EIR *prior to approving the project*; and
(3) The final EIR reflects the lead agency's independent judgment and analysis." (*emphasis added*)

Given that no decision has yet been made, there has been no violation of CEQA.

The commenter is correct that the THP is processed through the CAL FIRE Santa Rosa Office, whereas the TCP and Draft EIR are processed through the state CAL FIRE office located in Sacramento. However, the public noticing procedures were designed to inform interested parties in a wide range of geographic areas, contrary to the commenter's assertion. In accordance with CEQA *Guidelines* § 15082, a Notice of Preparation (NOP) was circulated to the public, local, State, and federal agencies, and other known interested parties for a 30-day public and agency review period which began on June 24, 2014 (included as Appendix A of the Draft EIR). The comment letters received (included as Appendix A of the Draft EIR) were used to focus the scope of the environmental analysis; all parties who responded to the NOP were added to the interested parties distribution list. In accordance with CEQA *Guidelines* §15087, a Notice of Completion (NOC) was submitted to the State Clearinghouse and other interested parties on August 21, 2015 (SCH# 2014062076), initiating a 45-day public comment period that ended on October 5, 2015. The State Clearinghouse notified all State agencies who may have interest in the Proposed Project, including CARB, Caltrans, CDFW, CAL FIRE, NAHC, Office of Historic Preservation, San Francisco RWQCB, the Resources Agency, and SWRCB.

In addition, a Notice of Availability (NOA) was published in the Napa Valley Register, a newspaper of general circulation in the project area, on August 21, 2015 notifying the public of the availability of the Draft EIR. Beginning on August 21, 2015, the NOA was also posted in the following locations: the Napa Valley County Clerk Office; the Lead Agency's office at 1416 9th Street, Sacramento, CA 95811; the St. Helena Public Library at 1492 Library Lane, St. Helena, CA 94574; the Santa Rosa Public Library at 211 E Street, Santa Rosa, CA 95404; the CAL FIRE Santa Rosa office at 135 Ridgeway Avenue, Santa Rosa, CA 95401; the CAL FIRE Sonoma-Lake-Napa Unit office at 1199 Big Tree Road, St. Helena, CA 94574; the Responsible Agency's (Napa County) office at 1195 Third Street, Suite 210, Napa, CA 94559. The NOA was sent to interested parties, including neighboring property owners and those who responded to the NOP during the scoping period.

Response to Comment A14-02

Refer to **General Response 5** for a discussion of erosion and sedimentation and **General Response 7** regarding water quality impacts to municipal suppliers.

Response to Comment A14-03

Refer to **General Response 2** regarding the adequacy of the Draft EIR.

Refer to **General Response 19** regarding the adequacy of the alternatives analysis presented in the THP and EIR. Six different alternatives to the Proposed Project are considered on pages 94 through 96.

As discussed in Impact 4.6-1, the rate of sediment leaving the property would decrease with implementation of the ECP, which ensures compliance with the Napa River sediment TMDL. See **General Response 5** for additional information on erosion and sedimentation.

Refer to **Response to Comment A4-01** regarding the review of public documents as it pertains to CEQA.

Responses to the Quercus Group's comments are provided in **Letter A10** above.

Cumulative impacts were addressed in Section 6.2.2; refer to **General Response 20**.

The Proposed Project will result in a net decrease in the rate of sedimentation to ensure compliance with the Napa River sediment TMDL. Refer to **General Response 5** for a discussion of erosion and sedimentation.

Refer to **General Response 16** regarding the adequacy of the climate change discussion presented in the Draft EIR and THP.

Response to Comment A14-04

The commenter cites the two alternatives that were analyzed in the Draft EIR (No Timber Conversion and No Timber Harvest), which were analyzed pursuant to CEQA. The commenter then compares the contents of the CEQA document to the requirements of the Forest Practice Rules. As discussed in **Response to Comment A10-01**, separate statutory requirements guide the environmental review of the THP versus the EIR. As stated on pages 1-1 and 3-5 of the Draft EIR, the THP is prepared concurrently with the Draft EIR by CAL FIRE under a CEQA-equivalent process guided by the Forest Practice Rules. The EIR is prepared in accordance with CEQA and the CEQA *Guidelines*. The requested alternative has been considered in the

THP under "Sale of the Property" on page 94. Refer to **General Response 19** regarding the adequacy of the alternatives analysis presented in the Draft EIR.

Response to Comment A14-05

Refer to **General Response 7** regarding impacts to water quality and municipal water suppliers. As discussed in Impact 4.6-1, the rate of sediment leaving the property would decrease with implementation of the ECP, which ensures compliance with the Napa River sediment TMDL. See **General Response 5** for additional information on erosion and sedimentation. Refer to **Response to Comment A4-02** regarding the de-listing of the Napa River for nutrients.

Response to Comment A14-06

Refer to **Response to Comment A4-01** regarding the review of public documents as it pertains to CEQA.

Response to Comments A14-07 and A14-08

Refer to **General Response 16** regarding the methodology used to estimate GHG emissions. Responses to the Quercus Group's comments are provided in **Letter A10** above.

Response to Comment A14-09

Napa County Ordinance 1219 adopts Sections 18.108.027 of the Napa County Code, which states that:

> "A minimum of sixty percent of the tree canopy cover on the parcel existing on June 16, 1993 along with any understory vegetation, or when vegetation consists of shrub and brush without tree canopy, a minimum of forty percent of the shrub, brush and associated annual and perennial herbaceous vegetation shall be maintained as part of any use involving earth-disturbing activity."

The Proposed Project was designed to be in compliance with this ordinance, as analyzed in Impact 4.9-5 of the Draft EIR. Refer to **General Response 20** regarding the adequacy of the cumulative analysis presented in the Draft EIR.

Response to Comment A14-10

As discussed further in **General Response 5**, the Napa River Watershed Sediment TMDL and Habitat Enhancement Plan specifically states that an "effective means of reducing sediment

delivery from sheetwash erosion would be for all vineyards to meet the performance standards specified under the Napa County Conservation Regulations (Chapter 18.108)" (Napolitano et. al, 2007). The Proposed Project is designed to comply with Chapter 18.108, and is therefore compliant with the Napa River Sediment TMDL and Section 303(d) of the Clean Water Act.

Response to Comment A14-11

Refer to **General Response 16** regarding the methodology used to estimate GHG emissions, which followed the most up to date methodology as required by BAAQMD and CARB.

Response to Comment A14-12

Refer to **General Response 16** regarding the methodology used to estimate GHG emissions and **General Response 20** regarding the adequacy of the cumulative analysis presented in the Draft EIR.

Response to Comment A14-13

Refer to **General Response 2** regarding the adequacy of the Draft EIR and **General Response 18** regarding the consistency analysis of the Proposed Project with relevant local policies.

Letter A15 April Rose Sommer, Center for Biological Diversity, November 9, 2015

Response to Comment A15-01

Comment noted. As discussed in **Response to Comment A10-01**, separate statutory requirements guide the environmental review of the THP versus the EIR. As stated on pages 1-1 and 3-5 of the Draft EIR, the THP is prepared concurrently with the Draft EIR by CAL FIRE under a CEQA-equivalent process guided by the Forest Practice Rules. The EIR is prepared in accordance with CEQA and the CEQA *Guidelines*.

Response to Comment A15-02

The commenter presents an excerpt of the Estimated Surface Soil Erosion Hazard worksheet presented on page 25 of the THP. As stated throughout the THP and Draft EIR, slopes on the project site range from 8 to 27 percent. Refer to **Response to Comment A6-04** regarding the slopes on the property versus the project site.

Commenter correctly notes that the soil units mapped on the project have names that include slope ranges (e.g. Aiken loam, 15-30%); these slope ranges in the soil name denote the typical

slopes where the soil may be found, and do not correspond to actual on-the-ground conditions. Therefore, the THP appropriately utilized the soil types with the more accurate site topographical mapping to prepare the Soil Erosion Hazard worksheet.

All project activities are set back from the on-site USGS blue line streams and Class III water course by buffer zones ranging from 55 to 125 feet, consistent with Napa County ordinance and Forest Practice Rules, and no activities would take place within these setbacks.

Response to Comment A15-03

Refer to **General Response 11** regarding the western pond turtle, including the petition for listing that is currently being considered by the USFWS. Impacts to California red-legged frog (CRLF) were addressed in Impact 4.4-8 of the Draft EIR; in order to ensure that the Proposed Project would not result in take of this federally threatened species, Mitigation Measure 4.4-8 (THP Mitigation #23) requires protective measures consistent with USFWS Scenario IV.

Response to Comment A15-04

As discussed above, impacts to California red-legged frog (CRLF) were addressed in Impact 4.4-8 of the Draft EIR; in order to ensure that the Proposed Project would not result in take of this federally threatened species, Mitigation Measure 4.4-8 (THP Mitigation #23) requires protective measures consistent with USFWS Scenario IV. Reliance on the USFWS-approved take avoidance scenario ensures that impacts are reduced to less-than-significant levels. Protocol-level surveys are not required as requested by the commenter.

Northern spotted owl (NSO) are addressed in Impact 4.4-4 of the Draft EIR, and Mitigation Measure 4.4-4 (THP Mitigation #14) is required to ensure the Proposed Project is in compliance with the take avoidance scenario set forth in 14 CCR 919.9(e) Scenario 3.

3.4 PRIVATE PARTY COMMENTS

Letter P1 Dick Crain, July 30, 2015

Response to Comment P1-01

During the Pre-Harvest Inspection (PHI) conducted on August 25, 2015, the California Geological Survey (CGS) performed an Engineering Geologic Review of the THP. During this analysis, the length of Friesen Drive was evaluated. As a whole, CGS found Friesen Drive to be in good condition with no erosion sites. Refer to **General Response 9** for additional discussion regarding the condition of the access road to the subject property.

Letter P2 David Graves, September 25, 2015

Response to Comment P2-01

Refer to **General Response 2** regarding comments on the adequacy of the Draft EIR.

Response to Comment P2-02

The western pond turtle is currently under review by the USFWS for listing as threatened or endangered under FESA (USFWS, 2015); however, it is not yet considered a candidate species. Pursuant to FESA, until such a time that the western pond turtle does become listed, no additional legal protections are afforded by FESA to this species (USFWS, 2014). However, western pond turtle is adequately protected by the CDFW's SSC status, which ensures that the species must be considered by projects requiring discretionary approval. Refer to **General Response 11** for additional discussion on the western pond turtle.

Response to Comment P2-03

Commenter refers to the Executive Summary (Section 2.0 of the Draft EIR) and alleges that the analysis is insufficient to address potential impacts to western pond turtle by referring to the summary. However, the complete analysis of potential impacts to western pond turtle can be reviewed on pages 4.4-52 (Impact 4.4-7). The commenter asserts that the Draft EIR makes no mention of the western pond turtle's use of terrestrial habitat. However, on page 4.4-36 of the Draft EIR, western pond turtle terrestrial use of nesting is discussed. Refer to **General Response 11** regarding the western pond turtle.

Response to Comment P2-04

As the western pond turtle is not currently a federally listed or candidate species, the Draft EIR appropriately discusses the species' status as a SSC per CEQA *Guidelines*. Refer to **General Response 4** regarding the project site's proximity to the Dunn-Wildlake Preserve and **General Response 11** regarding the western pond turtle. Finally, refer to **General Response 2** regarding the adequacy of the Draft EIR.

Letter P3 Dick Crain, September 28, 2015

Response to Comment P3-01

Refer to **General Response 9** regarding the concrete slab crossing. As discussed in **General Response 9**, CGS found Friesen Drive to be in good condition with no erosion sites. According to CGS, the slab is in good condition and does not appear degraded. In a conversation with CGS, the system manager of the Howell Mountain Mutual Water Company stated that trucks

routinely traverse the slab without adverse impact. The manager also indicated he has never witnessed water running over the surface of the slab. Under current conditions, Friesen Drive (and therefore the concrete slab crossing) is used by existing vineyard's equipment, Howell Mountain Mutual Water Company, and visitors to the Napa Land Trust's property, with no adverse impacts to water quality or to overall stability.

Response to Comment P3-02

There are no changes or modifications proposed to the concrete slab crossing on Friesen Drive. As discussed in **General Response 9**, the continued use of the existing concrete slab crossing would not have a significant impact. In *Nollan v. California Coastal Commission* (483 U.S. 825 [1987]), the U.S. Supreme Court held that there must be an "essential nexus" between the government's requirement for an easement dedicating real property and a legitimate government interest. In *Dolan v. City of Tigard* (512 U.S. 374 [1994]), the U.S. Supreme Court found that an exaction requiring dedication of real property must be "roughly proportional" to the impact of the proposed development. These two standards for mitigation measures – essential nexus and proportionality – were codified in CEQA *Guidelines* § 15126.4 (a)(4). Although these cases defined mitigation requirements for governmental taking of real property, the majority decision of *Koontz v. St. Johns River Water Management District* (568 U.S. ___ [2013]) held that "so-called 'monetary exactions' must satisfy the nexus and rough proportionality requirements of *Nollan* and *Dolan*." Therefore, it is not appropriate for the project applicant to be responsible for payment of the requested upgrades to the concrete slab, as this impact has been reduced to less-than-significant levels and this is not proportional to the impact.

Letter P4 Donald and Joanne Yates, September 28, 2015

Response to Comment P4-01

Refer to **General Response 21** regarding requests for a moratorium on vineyard development. Also, refer to **General Response 7** and **General Response 14** for discussions on water quality impacts to municipal suppliers and habitat fragmentation, respectively.

Letter P5 Michael Heffner, September 28, 2015

Response to Comment P5-01

Refer to **General Comment 1** regarding statements of opinion. Wind patterns are not considered a significant environmental impact that requires analysis under CEQA.

Response to Comment P5-02

Refer to **General Comment 15** regarding wildlife displacement.

Response to Comment P5-03

Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including the City of St. Helena's water supply.

Response to Comment P5-04

Refer to **General Comment 1** regarding non-substantive comments.

Letter P6 Michelle MacKenzie, September 28, 2015

Response to Comment P6-01

Refer to **General Response 7** regarding water quality impacts to municipal water suppliers, including the City of St. Helena's water supply.

Response to Comment P6-02

Refer to **General Response 4** regarding the project site's proximity to the Dunn-Wildlake Preserve. Refer to **General Response 14** and **General Response 15** regarding habitat fragmentation, wildlife corridors, and wildlife displacement. Refer to **Response to Comment A6-11** regarding the impact analysis and mitigation presented in the Draft EIR for nesting and migratory birds.

Letter P7 Robin Lail, Lail Vineyards, September 28, 2015

Response to Comment P7-01

Refer to **General Response 22** regarding extension requests.

Response to Comment P7-02

Refer to **General Response 7** regarding water quality impacts to municipal water suppliers, including the City of St. Helena's water supply.

Letter P8 Kara Dunn, Retro Cellars, September 30, 2015

Response to Comment P8-01

Refer to **General Response 4** regarding the project site's proximity to the Dunn-Wildlake Preserve. Refer to **General Response 14** and **General Response 15** regarding habitat fragmentation, wildlife corridors, and wildlife displacement.

Letter P9 Gary Dowling, September 30, 2015

Response to Comment P9-01

Refer to **General Response 7** regarding water quality impacts to municipal water suppliers and specific impacts to Bell Canyon Reservoir. Refer to **General Response 4** regarding the project site's proximity to the Dunn-Wildlake Preserve. Additionally, refer to **General Response 1** regarding statements of opinion.

Letter P10 Tracey Hawkins, September 30, 2015

Response to Comment P10-01

Refer to **General Response 22** regarding extension requests and **General Response 1** regarding statements of opinion.

Response to Comment P10-02

The primary objective of the Proposed Project as discussed in Section 3.3 is to "develop high quality wine grapes" on the project site. The harvesting of timber is one facet related to the larger project as proposed. The commenter contends that recent fires elsewhere in the Mayacama Mountain range would preclude the harvest of approximately 10.0 acres of timber on the project site. Although CAL FIRE acknowledges that there have been recent, devastating fires elsewhere in Napa and Lake counties, this does not directly impact the legal rights of a property owner from seeking to develop their private property with proper permits and approvals. All environmental impacts to water quality, special status species, traffic, noise, wildlife movement, and habitat fragmentation have been reduced to less-than-significant levels in accordance with CEQA and the CEQA *Guidelines*.

Response to Comment P10-03

Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including the City of St. Helena's water supply.

Response to Comment P10-04

Refer to **General Response 4** regarding the project site's proximity to the Dunn-Wildlake Preserve. Refer to **General Response 14** and **General Response 15** regarding habitat fragmentation, wildlife corridors, and wildlife displacement.

Letter P11 Lisa Hirayama, October 3, 2015

Response to Comment P11-01

Refer to **General Response 22** regarding extension requests and **General Response 1** regarding statements of opinion.

Response to Comment P11-02

Refer to **General Response 12** regarding the HRA, which has been designed to reduce all impacts to oak woodland to less-than-significant levels. As discussed in Impact 4.6-1, the rate of sediment leaving the property would decrease with implementation of the ECP, which will be protective of water quality. See **General Response 5** for additional information on erosion and sedimentation and **General Response 7** regarding water quality impacts to municipal suppliers.

Response to Comment P11-03

Refer to **General Response 8** regarding groundwater use, availability, allowances, and recharge rates. The Proposed Project is in compliance with the Napa County Water Availability Analysis process and would obtain a groundwater use permit prior to vineyard development.

Letter P12 Ken Stanton, October 3, 2015

Response to Comment P12-01

Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including the City of St. Helena's water supply.

Response to Comment P12-02

Refer to **General Response 4** regarding the project site's proximity to the Dunn-Wildlake Preserve. Refer to **General Response 14** and **General Response 15** regarding habitat fragmentation, wildlife corridors, and wildlife displacement.

Response to Comment P12-03

Refer to **General Response 21** regarding requests for a moratorium on vineyard development.

Letter P13 Larry Carr, October 4, 2015

Response to Comment P13-01

Refer to **General Response 22** regarding extension requests and **General Response 7** regarding water quality impacts to municipal suppliers, including the City of St. Helena's water supply.

Response to Comment P13-02

Refer to **General Response 16** and **General Response 17** for discussions on climate change and air quality impacts, respectively.

Response to Comment P13-03

Refer to **General Response 8** regarding groundwater use, availability, allowances, and recharge rates. The Proposed Project is in compliance with the Napa County Water Availability Analysis process and would obtain a groundwater use permit prior to vineyard development.

Letter P14 Linnea Carr, October 5, 2015

Response to Comment P14-01

Refer to **General Response 22** regarding extension requests and **General Response 19** regarding the adequacy of the alternatives analysis presented in the Draft EIR. Refer to **General Response 14** and **General Response 15** regarding habitat fragmentation, wildlife corridors, and wildlife displacement. The entirety of the Proposed Project, including tree removal, erosion control measures, and planted cover crop, is included in the soil loss and hydrologic modeling via the use of curve numbers and land use estimates. The models estimate a decrease in erosion from the project site in post-project conditions. Refer to **General Response 5** and **General Response 7** regarding erosion and sedimentation and water quality impacts to municipal suppliers, respectively.

Response to Comment P14-02

Refer to **General Response 4** regarding the project site's proximity to the Dunn-Wildlake Preserve and **General Response 14** regarding wildlife movement.

Response to Comment P14-03

Refer to **General Response 8** regarding groundwater use, availability, allowances, and recharge rates. The Proposed Project is in compliance with the Napa County Water Availability Analysis process and would obtain a groundwater use permit prior to vineyard development.

Refer to **General Response 16** regarding the adequacy of the climate change analysis presented in the Draft EIR.

Letter P15 Kellie Anderson, October 5, 2015

Response to Comment P15-01

Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including the Town of Angwin's water supply.

Response to Comment P15-02

Refer to **General Response 9** regarding the concrete slab crossing along Friesen Drive. No significant water quality impacts due to the proposed use of the existing crossing have been identified by CGS or Howell Mountain Mutual Water Company general manager.

Response to Comment P15-03

Refer to **General Response 6** and **General Response 7** regarding pesticides and water quality impacts to municipal suppliers, respectively. The discharge of hydrocarbons, oil and gas pollutants, pesticides, and fertilizers directly into a water body is not legal, and therefore the deliberate dumping of chemicals into waterways on the property or along Friesen Drive is not reasonably foreseeable. The risk of contamination of the Friesen Lakes due to accidental discharges is minimized through numerous BMPs as required in Mitigation Measures 4.8-1 through 4.8-3 (THP Mitigation #9 through #11).

There is an inherent risk of hazardous materials incidents in all vineyard development and operation practices found throughout Napa County, including the Proposed Project (refer to Impacts 4.561 through 4.8-3 of the Draft EIR). However, CEQA recognizes that it is impossible to completely eliminate some environmental impacts, and therefore CEQA focuses on the need to "avoid or *substantially lessen*" a project's significant impacts (Pub. Resources Code, § 21002.). In accordance with CEQA, the EIR appropriately provides numerous legally binding, enforceable mitigation measures to reduce the risk of hazardous material impacts to the public and the environment to less-than-significant levels. It is impossible to completely eliminate the risk of an accident occurring, but numerous mitigation measures have been provided to significantly reduce the risk. No further mitigation is required under CEQA.

Response to Comment P15-04

Refer to **Response to Comment P15-03** above regarding the risk of pesticide transportation inherent in any and all vineyard development projects in Napa County. The cumulative impacts

to water quality are discussed in Sections 6.2.2-8 and 6.2.2-9 of the Draft EIR; refer to **General Response 20** regarding the adequacy of the cumulative analysis presented in the Draft EIR. Finally, refer to **General Response 9** regarding the concrete slab crossing along Friesen Drive.

Response to Comment P15-05

The use of portapotties is acknowledged in Section 1.6 of the Draft EIR. Refer to **Response to Comment P15-03** above regarding the risk of chemical transportation inherent in any and all vineyard development projects in Napa County.

Response to Comment P15-06

Refer to **General Response 1** regarding expressions of opinion.

Letter P16 Shelle Wolfe, Wine+Dine Events, October 5, 2015

Response to Comment P16-01

Refer to **General Response 1** regarding expressions of opinion and **General Response 21** regarding requests for a moratorium on vineyard development. All impacts to traffic, General Plan consistency, biological resources, and hydrological resources have been reduced to less-than-significant levels.

Letter P17 Norm Manzer, October 5, 2015

Response to Comment P17-01

Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including the City of St. Helena's water supply.

Response to Comment P17-02

Refer to **General Response 20** regarding cumulative effects of the Proposed Project and **General Response 21** regarding requests for a moratorium on vineyard development.

Letter P18 Carrie Dunn, October 5, 2015

Response to Comment P18-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion.

Letter P19 Marietta Dunn, October 5, 2015

Response to Comment P19-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion. Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including the City of St. Helena's water supply.

Letter P20 Davie Pina, October 5, 2015

Response to Comment P20-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion.

Letter P21 Rod Field, October 5, 2015

Response to Comment P21-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion.

Letter P22 Cary Gott, Cary Gott Vineyard & Winery Estates, October 5, 2015

Response to Comment P22-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion.

Letter P23 Arthur DellaBruna, October 5, 2015

Response to Comment P23-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion.

Letter P24 Kevin Dickenson, October 5, 2015

Response to Comment P24-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion.

Letter P25 Rich and Leslie Frank, Frank Family Vineyards, October 5, 2015

Response to Comment P25-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion. Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including the City of St. Helena's water supply.

Letter P26 Stuart Smith, Smith-Madrone Vineyards & Winery October 5, 2015

Response to Comment P26-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion.

Letter P27 May-Britt Malbec, Notre Vin, October 5, 2015

Response to Comment P27-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion. Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including the City of St. Helena's water supply.

Letter P28 Louis Ciminelli, LPCiminelli, October 5, 2015

Response to Comment P28-01

The commenter's favorable opinion of the Proposed Project has been noted. Refer to **General Response 1** regarding expressions of opinion. Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including the City of St. Helena's water supply.

Letter P29 Jim Wilson, October 5, 2015

Response to Comment P29-01

Refer to **General Response 16** regarding the methodology used to estimate GHG emissions, which followed the most up to date methodology as required by BAAQMD and CARB. Comments related to Napa County policies allowing too much development are beyond the scope of this EIR and the CEQA process. However, commenters can work with the County outside of the CEQA process to address these concerns.

Although the commenter is correct that Napa County's Climate Action Plan is still in draft form, it preliminarily recommends a reduction in GHG emissions of 38 percent from "business as usual" practices. Retention of timber as lumber results in the offset of 1,851 MT of CO_2e, a decrease of 61 percent from "business as usual" development. This 61 percent reduction is much greater

than the 38 percent reduction required by the Napa County draft Climate Action Plan or by AB 32. Therefore, this is a less-than-significant impact. However, Mitigation Measure 4.7-1 (THP Mitigation #21) provides additional measures that would have a further beneficial reduction in GHG emissions.

Response to Comment P29-02

The Draft EIR analyzes methane (CH_4), nitrous oxide (N_2O), and carbon dioxide (CO_2) by utilizing the carbon dioxide equivalent (CO_2e) method. As stated in Section 4.7.3, "CO_2e is a method by which GHGs other than CO_2 are converted to a CO_2-like emission value based on the global warming potential (GWP). CO_2 is used as the base and is given a value of one. Methane (CH_4) has the ability to capture 21 times more heat than CO_2; therefore, CH_4 is given a CO_2e value of 21." By providing a common measurement, CO_2e provides a means for presenting the relative overall effectiveness of emission reduction measures for various GHGs in reducing project contributions to global climate change. Therefore, contrary to the commenter's assertions that N_2O and CH_4 were omitted from the analysis, they were appropriately standardized into their CO_2e values to provide a common measurement.

Calculation of black carbon loading is not recommended by the BAAQMD CEQA Guidelines or any other recognized methodology in California; therefore, black carbon loading was not calculated for this project. Black carbon is a material produced by the incomplete combustion of heavy petroleum products, which will not be a significant component to the GHG emissions of this project.

Response to Comment P29-03

Refer to **Response to Comment P29-02** above regarding the use of CO_2e in the GHG analysis. Refer to **General Response 16** regarding the methodology used to estimate GHG emissions, which followed the most up to date methodology as required by BAAQMD and CARB. Proposed vineyard blocks have been chosen based on multiple factors, including soils, topography, and farmability. As discussed in Sections 3.0 and 4.4.4 of the Draft EIR, a mixture of habitat types would be impacted by the Proposed Project, including timberland, grassland, and chamise chaparral. As shown in Table 4.7-2, no mitigation is required to be implemented for the loss of sequestration due to vegetative matter (trees and plant life) removal. Furthermore, as stated in Section 4.7 of the Draft EIR, the BAAQMD CEQA Guidelines does not recommend including the loss of sequestration due to a reduction in vegetative matter (trees and plant life).

Response to Comment P29-04

The Draft EIR provides GHG emissions from soil tilling in Table 4.7-1 of the Draft EIR; however, comprehensive scientific studies on vineyard GHG emissions and sequestration are not available. Therefore, in compliance with the BAAQMD CEQA Guidelines, these GHG emissions and reductions were not included in the climate change analysis. Although vineyards would provide some carbon sequestration benefits, this was not included in the analysis to provide a more conservative estimation of GHG emissions. Biomass will be disposed of consistent with industry standards.

Response to Comment P29-05

The GHG analysis is based on annual emissions for both the construction (Impact 4.7-1) and the operational phases (Impact 4.7-2). To the extent that "short-lived climate pollutants" such as methane or fluorinated gases would be produced by the Proposed Project, they have been included in the CalEEMod analysis of GHG emissions and standardized to their CO_2e values. Refer to **Response to Comment P29-02** above regarding the use of CO_2e in the GHG analysis.

Concerns related to County General Plan policies and the General Plan EIR are beyond the scope of this EIR and the CEQA process. However, commenters can work with the County outside of the CEQA process to address these concerns.

Letter P30 Christopher Jambois, October 5, 2015

Response to Comment P30-01

Refer to **General Response 1** regarding expressions of opinion and **General Response 4** regarding the project site's proximity to the Dunn-Wildlake Preserve.

Response to Comment P30-02

Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including St. Helena's water supply and **General Response 4** regarding the project site's proximity to the Dunn-Wildlake Preserve. Refer to **General Response 14** and **General Response 15** regarding habitat fragmentation, wildlife corridors, and wildlife displacement.

Letter P31 Grete Orsoe, October 6, 2015

Response to Comment P31-01

Refer to **General Response 1** regarding expressions of opinion. The property is zoned Agricultural Watershed (AW), not Agricultural Preserve as stated by the commenter. Refer to **General Response 21** regarding requests for a moratorium on vineyard development.

Letter P32 Geoff Ellsworth, November 9, 2015

Response to Comment P32-01

Refer to **General Response 7** regarding water quality impacts to municipal suppliers, including the City of St. Helena's water supply. The Proposed Project will result in a net decrease in sedimentation from the property, and is therefore compliant with the Napa River Sediment TMDL. Refer to **General Response 5** regarding the reduction in erosion from the property in post-project conditions.

Response to Comment P32-02

Refer to **General Response 19** regarding the adequacy of the alternatives analysis.

Response to Comment P32-03

Responses to the Quercus Group's comments are provided in **Letter A10** above.

Response to Comment P32-04

Refer to **Response to Comment A14-01** regarding the review of public documents.

Response to Comment P32-05

Refer to **General Response 11** regarding impacts to western pond turtle.

Response to Comment P32-06

Refer to **General Response 20** regarding the adequacy of the cumulative analysis presented in the Draft EIR.

Response to Comment P32-07

As discussed further in **General Response 5**, the Napa River Watershed Sediment TMDL and Habitat Enhancement Plan specifically states that an "effective means of reducing sediment delivery from sheetwash erosion would be for all vineyards to meet the performance standards specified under the Napa County Conservation Regulations (Chapter 18.108)" (Napolitano et. al, 2007). The Proposed Project is designed to comply with Chapter 18.108, and is therefore compliant with the Napa River Sediment TMDL and Section 303(d) of the Clean Water Act.

Response to Comment P32-08

Governor's EO B-30-15 was signed April 29, 2015, and sets a GHG emission reduction of 40 percent below 1990 levels by 2030. As discussed in **General Response 16**, the Proposed Project would result in a reduction of 61 percent of GHG emissions, which is consistent with EO B-30-15.

REFERENCES

Bay Area Air Quality Management District (BAAQMD), 2008. *Regulation 5: Open Burning.* July 9, 2008. Accessed at: http://hank.baaqmd.gov/dst/regulations/rg0500.pdf. Accessed on: January 21, 2016.

California Invasive Plant Council (CalIPC), 2016. California Invasive Plant Inventory Database. Available online at: http://www.cal-ipc.org/paf/. Accessed January 28, 2016.

California Department Fish and Wildlife (CDFW), 2016. Black Bear Population Information. Available online at: http://www.dfg.ca.gov/wildlife/hunting/bear/population.html. Accessed February 1, 2016.

City of St. Helena, 2012. 2012 Consumer Confidence Water Quality Report. Accessed at: http://cityofsthelena.org/sites/default/files/2012CCR-FINAL.pdf

Comrack, L., B. Bolster, J. Gustafson, D. Steele, and E. Burkett. April 10, 2008. Species of Special Concern: A Brief Description of an Important California Department of Fish and Game Designation. California Department of Fish and Game, Wildlife Branch, Nongame Wildlife Program Report 2008-03, Sacramento, CA. 4pp.

Department of Water Resources (DWR), 2015. *California's Most Significant Droughts: Comparing Historical and Recent Conditions*. Jones, Jeanine, et al., February 2015.

Grismer, M.E., O'Green, A.T., Lewis, D., 2006. University of California Division of Agriculture and Natural Resources. *Vegetative Filter Strips for Nonpoint Source Pollution Control in Agriculture.* Publication 8195.

Grismer M. E and Asato C., 2012. California Agriculture 66(4):144-152. DOI: 10.3733/ca.v066n04p144.October-December 2012. Available at: http://californiaagriculture.ucanr.edu/landingpage.cfm?article=ca.v066n04p144&fulltext=yes. Accessed on: November 12, 2015.

Hilty J. and A. Merenlender, 2002. *Vineyard Landscape, Wildlife Activity Along Creek Corridors*. Practical Winery and Vineyard: November/December 2002. Available online at: http://www.practicalwinery.com/novdec02/novdec02p6.htm.

Hilty, J.A. and Merenlender A.M., 2004. Conservation Biology. Use of Riparian Corridors and Vineyards by Mammalian Predators in Northern California. Accessed at: http://ucanr.org/sites/merenlender/files/143678.pdf

Information Center for the Environment (ICE), 2013. Vegetation community dataset developed by the ICE at UC Davis. Originally developed for the Napa County Baseline Data Report; updated in 2012.

Jennings, M.R. and Hayes, M.P., 1994. Amphibians and Reptiles of Special Concern. California Department of Fish and Game, Inland Fisheries Division.

Keeley, J.E., Bond, W.E., Bradstock, R.A., Pauses, J.G, Rundel, P.W., 2012. *Fire In Mediterranean Ecosystems: Ecology, Evolution and Management*. Cambridge University Press.

Kjeldsen, 2015. Biological Resources Report: Friesen Drive THP/TCP, Napa County. Prepared by Kjeldsen Biological Consulting. March 2015.

Origer, Thomas and Lauren Del Bondio, 2013a. A Cultural Resources Survey for the Friesen – Davis Vineyard Conversion Project. Angwin, Napa County, California. Revised September 17, 2013.

Origer, Thomas, Eileen Barrow, and Lauren Del Bondi, 2013b. Archaeological Investigations at CA-NAP-1124, Northwest of Angwin, Napa County, California. September 26, 2013.

Napa County Conservation, Development, and Planning Department (NCCDPD), 2011. Napa County Baseline Data Report (NCBDR): Version 1; Chapter 4 Biological Resources. Napa County, California.

Napa Valley Vineyard Engineering (NVVE), 2014. Davis/Bercovich Erosion Control Plan File #P13-00373-ECPA. Water Demand and Water Availability Analysis. January 14, 2014.

Napolitano, M., Potter, S., and Whyte, D. 2007. Napa River Watershed Sediment TMDL and Habitat Enhancement Plan. San Francisco, San Francisco Bay Water Quality Control Board, San Francisco Bay Region.

Rathbun, G. B., N. J. Scott, Jr., and T.G. Murphey, 2002. Terrestrial habitat use by Pacific pond turtles in a Mediterranean climate. *The Southwestern Naturalist*. 47: 225-235.

United States Environmental Protection Agency (USEPA), 1986. Quality Criteria for Water. Office of Water Regulations and Standards. Available online at: http://nepis.epa.gov/Exe/ZyPDF.cgi/00001MGA.PDF?Dockey=00001MGA.PDF

USEPA, 1997. "State Methods for Delineating Source Water Protection Areas for Surface Water Supplied Sources of Drinking Water", August 1997. Accessed at: http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=200026TN.txt

U.S. Fish and Wildlife Service, 2015. ECOS Environmental Conservation Online System: Species Profile for western pond Turtle. Available at: http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=C06B. Accessed on November 17, 2015.

USFWS, 2014. Candidate Species. *Section 4 of the Endangered Species Act.* Available at: https://www.fws.gov/endangered/esa-library/pdf/candidate_species.pdf. Accessed on November 17, 2015.

University of California Agriculture and Natural Resources (UC ANR), 2015. Statewide Integrated Pest Management Program: Beneficial Predators. Available online at: http://www.ipm.ucdavis.edu/QT/beneficialpredatorscard.html. Last updated June 15, 2015. Accessed January 28, 2016.

Western Regional Climate Center, 2015. Angwin Pac Union Col, California (040212). Period of Record Climate Summary. Available online at: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca0212. Accessed November 4, 2015.

SECTION 4.0

TEXT REVISIONS TO THE DRAFT EIR

SECTION 4.0

TEXT REVISIONS TO THE DRAFT EIR

4.1 INTRODUCTION

The following corrections/edits have been made to the text of the Draft Environmental Impact Report (EIR) subsequent to its public release in August of 2014. Corrections or clarifications have been made to address comments and to update information. Text that has been deleted from the EIR will be marked in this section as a strikeout (~~deleted text~~), while new text will be underlined (new text).

4.2 TEXT REVISIONS

In Section 2.2.1 Project Location, 3.2 Site and Vicinity, 4.4.3-1 Regional Setting, and 4.4.3-2 Project Parcel, the discussion of slopes on the property versus within the project site has been clarified as follows:

Existing slopes within the project site ~~on the property~~ generally range from 8 to 27 percent; less than 1 acre contains slopes of 30 percent or greater.

****

In Section 3.4.2-4, the following sentence of clarification has been added:

3.4.2-4 ROAD CONSTRUCTION AND MAINTENANCE

Approximately 3.1 acres of the project site are planned to be allocated to accommodate internal farm avenues for farm trucks, equipment turn around, and vineyard maintenance operations. New farm avenues would be located around a portion or the entire perimeter of vineyard blocks and within Vineyard Block D. The majority of new farm avenues will be built and maintained with crushed rock. No road construction is proposed under the project.

****

Mitigation Measure 4.4-1 in Section 4.4.6-2 of the Draft EIR and in the MMRP Table (found in **Section 5.0** of this Final EIR) has been revised as follows:

Mitigation Measure 4.4-1: A Habitat Retention Area (HRA) shall be created on the property that protects oak woodlands via two mechanisms: retention and enhancement. Mitigation for the 5.32 acres of oak woodland impacted by the project at a 2:1 ratio would necessitate 10.6± acres of high value woodland habitat be enhanced and maintained within the property. This HRA is shown in **Figure 4.4-3** and discussed further below.

A total of 13.1 acres are included in the HRA; this acreage includes the 3.5± acres of oak woodland habitat that will not be impacted by the Proposed Project. The remaining 9.6± acres of the HRA is comprised of California Foothill Pine Alliance and Chamise Chaparral Alliance that contains scattered black and interior live oaks, and will be enhanced as discussed below.

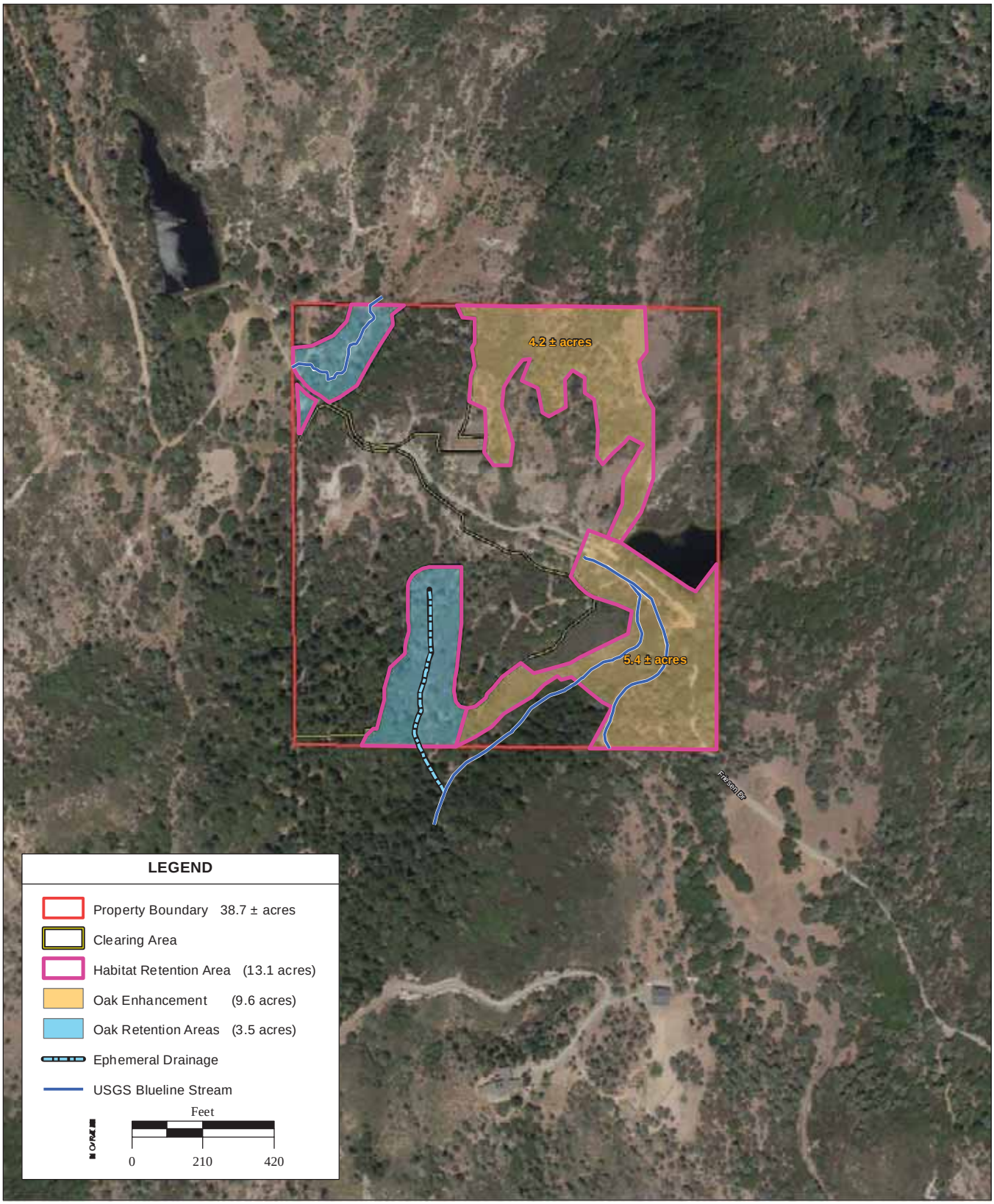
Retention

Avoidance measures would retain areas identified as high value oak woodlands that occur along riparian corridors. Furthermore, oak trees provide slope stability and reduced erosion, particularly on steep slopes (i.e., greater than 30 percent) and near the heads of drainages. A total of 3.5± acres of existing Mixed Oak Alliance within the property shall be retained by means of avoidance to the maximum extent feasible through project design.

All avoided trees within 50 feet of ground-disturbing activities shall be protected with visible plastic fencing during all phases of construction activities. Visible fencing shall be placed at the outside edge of the dripline (edge of the tree canopy) to protect above- and below-ground tissues of these trees and shall be field verified by Napa County prior to the commencement of any grading or vegetation removal. The following shall not occur within the buffers of any retained tree(s): parking or storage of vehicles, machinery, or other equipment; stockpiling of excavated soils, rocks, or construction materials; or dumping of oils or other chemicals.

Enhancement and Restoration

The Oak Enhancement Areas shown in **Figure 4.4-4** contain oaks in the overstory canopy and in the understory canopy. The HRA proposes to reduce competition for the oaks in the understory by removing competition associated with the non-oak trees in the overstory. This will entail removing California foothill pine (*Pinus sabiniana*) and/or chaparral [chamise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos* ssp.), etc.]. This reduction may be in the form of cutting pine into firewood and/or creating standing snags to improve wildlife habitat. This will be done on a site-specific basis as directed by a Registered Professional Forester. This reduction will be accomplished by the use of chainsaws to cut the manzanita and the pine trees. The manzanita will be left in place to provide protective habitat for birds



SOURCE: Napa County aerial photograph, 6/5/2014; ESRI Data, 2013; AES, 12/7/2015

Figure 4.4-3
Habitat Retention Area

and animals, while the pine will be removed if it can be accessed from the existing road. However, most of it will be felled and/or girdled. Girdling of the pine trees will create snag habitat presently lacking in some areas. No mechanical equipment is allowed in the HRA, except on the existing Friesen Drive. All chainsaw work to reduce overstory competition from the manzanita and pines shall be done during the month of November, with no exceptions. This will allow the operator to easily locate and protect the black oak, as leaves will have begun senescence and should be yellow by then. Operations are also limited to November with the creation of the pine snags. The cooler weather and late season will eliminate potential increases in insect populations associated with the pine. It is anticipated that about 30 percent of the pines will be affected.

Reducing the overstory competition will allow the existing oak seedlings to grow; using naturally-established oaks rather than replanting will also ensure higher success rates of mature oaks. At a minimum, a total of 9.6 acres of Oak Enhancement Areas, as identified on **Figure 4.4-4**, shall receive the treatment described above.

Monitoring and Reporting

Restoration and enhancement areas shall be monitored by a qualified botanist or biologist annually for a minimum of five years. Annual monitoring shall be submitted to Napa County by January 1 of each year for five years after the successful completion of the replanting efforts and plan implementation.

With implementation of **Mitigation Measure 4.4-1**, impacts to oak woodlands would be reduced to less-than-significant levels. The HRA would contain 13.1 acres, which exceeds the 2:1 ratio of mitigated versus impacted oaks required by the Napa County General Plan Policy CON 24.

****

Selected text from **Impact** and **Mitigation Measure 4.4-3** has been revised as follows:

During the scoping period, the County suggested that a seed retention plan be implemented (**Appendix A**). Given that the Proposed Project would have an adverse effect on at least a portion of identified Napa lomatium areas and corresponding seed bank, a seed retention plan is required in **Mitigation Measure 4.4-3** to ensure that impacts to Napa lomatium are less than significant.

Mitigation Measure 4.4-3: A seed bank retention strategy shall be utilized for the protection of Napa lomatium (*Lomatium repostum*) on the property. Prior to ground disturbing activities, a qualified biologist or botanist shall delineate the extent of the Napa

lomatium populations on the property. The top inch of topsoil shall be skimmed at these locations and deposited outside of the project boundaries in an area that is ecologically suitable for Napa lomatium, as identified by the qualified biologist or botanist. To ensure mitigation success, monitoring by a qualified botanist or biologist shall be performed. Annual monitoring shall be submitted to Napa County by January 1 of each year for five years after the successful completion of the replanting efforts and plan implementation.

Implementation of **Mitigation Measure 4.4-3** would reduce the impacts to Napa lomatium to a less-than-significant level.

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Selected text from Mitigation Measure 4.4-5 has been revised as follows:

> **Mitigation Measure 4.4-5:** The Applicant shall implement the following measures to avoid disturbing any special status bird species nesting on the project parcel in accordance with the following CDFW-recommended measures:
>
> If project activities are scheduled between February 15 and September 15, the following surveys and avoidance measures for nesting birds shall be implemented, as recommended by CDFW. ~~recommends surveys and avoidance measures for nesting birds.~~ With respect to surveys for nesting bird and raptor species, ~~CDFW recommends that the project specifies:~~ 1) nest surveys shall be conducted no earlier than 14 days prior to tree removal and/or breaking ground (surveys shall ~~should~~ be conducted a minimum of 14 days prior to disturbance), 2) in the event that nesting birds are found, the project applicant shall ~~should~~ consult with CDFW and obtain approval for nest-protection buffers prior to tree removal and/or ground disturbing activities, and 3) nest protection buffers shall ~~will~~ remain in effect until the young have fledged. All nest protection measures shall ~~should~~ apply to off-site impacts and within 500 feet of project activities. If a lapse in project-related work of 15 days or longer occurs, another focused survey and, if required, consultation with CDFW, shall ~~will~~ be required before project work can be reinitiated. If active nests are found during a preconstruction survey, 300-foot no-disturbance buffer zones shall be created around active raptor and songbird nests and shall be maintained until it is determined by a qualified biologist that all young have fledged. These buffer zones may be modified in coordination with CDFW based on existing conditions at the project site. Buffer zones shall be fenced with temporary construction fencing and remain in place until the end of the breeding season or until the young have fledged. If a 15-day or greater lapse of project-related work occurs during the breeding season, another bird preconstruction survey and consultation with CDFW will be required before project work can be reinitiated.

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Selected text from **Impact** and **Mitigation Measure 4.4-7** has been revised as follows:

Impact 4.4-7: Development of the Proposed Project would not have the potential to affect the western pond turtle (WPT); therefore, this is a less-than-significant impact. Though impacts to WPT are less than significant, **Mitigation Measure 4.4-7** shall be in place to provide further protections for WPT.

A single WPT was observed in association with the reservoir located in the southeastern portion of the property. Given the distance from the reservoir and the fact that the reservoir is outside of project disturbance areas, it is unlikely that western pond turtles would utilize the project site for upland estivation habitat or for movement. Additionally, soil types, brush, and disturbances in the proposed vineyard plots are not suitable for the western pond turtle. Therefore, it is unlikely that western pond turtles would attempt to cross the existing Friesen Drive and enter the unsuitable habitat of the proposed vineyard plots. Development and operation of the vineyard would not use water from the reservoir and would not occur within the vicinity of the reservoir; therefore, no impacts to habitat associated with the reservoir where western pond turtles were observed would occur. The Wild Lake Reservoir located over 230 feet west of the property boundary may provide suitable habitat for WPT, but there is a sufficient buffer between project activities and the reservoir that no significant impacts to WPT would occur.

> **Mitigation Measure 4.4-7:** Orange construction fencing shall be placed along the east side of Friesen Drive. Placement of this fencing shall ensure neither construction equipment nor workers will disturb potential western pond turtle habitat associated with the on-site reservoir.

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Additional description of the Bell Canyon watershed and the Howell Mountain Mutual Water Company has been added to Section 4.9.1-2:

Bell Canyon Watershed

The property is situated on the northwest side of Howell Mountain, a peak that separates Napa Valley from Pope Valley to the east. The entire property consists of two parcels that total 38.7 acres, with the gross area of disturbance totaling 13.6± acres. Onsite elevations range from 1,600 to 2,000 feet above mean sea level, and slopes within proposed vineyard blocks range from approximately 8 to 27 percent. The property is located in the Bell Canyon watershed, a subwatershed of the Napa River Watershed. Bell Creek drains a watershed of approximately 10.1 square miles, including the subdrainage area of Canon Creek. Bell Creek is approximately

10.6 miles long, although only approximately 1.75 miles are located below the dam and are therefore accessible to salmonids (NCRCD, 2005). The project site is situated above the dam that forms Bell Canyon Reservoir, in the headwaters of the watershed. The property contains two U.S. Geological Survey (USGS) blue line streams, one Class III drainage, and a reservoir, but no jurisdictional wetlands.

Two municipal water suppliers, discussed below, draw their supply from water sources in the geographic vicinity of the Proposed Project. Bell Canyon Reservoir supplies drinking water to the City of St. Helena, while the Friesen Lakes supply drinking water to the town of Angwin.

City of St. Helena: Bell Canyon Reservoir

As discussed, the project site lies within the Bell Canyon watershed, which drains to Bell Canyon Reservoir. Canon Creek is the main tributary to Bell Creek, which enters the Bell Canyon Reservoir; Bell Creek flows approximately 1.7 miles from the base of the dam forming the reservoir to its confluence with the Napa River (NCRCD, 2005). The two existing USGS blueline streams and one existing Class III drainage on the property convey water within the Bell Canyon watershed, which eventually reaches the Bell Canyon Reservoir.

Water quality data from the State Water Resources Control Board (SWRCB), Division of Drinking Water was obtained for the Bell Canyon Reservoir. This data (included as **Appendix P** to this Final EIR), indicates that water quality is generally good for the watershed, with only three constituents (iron, color, and turbidity) exceeding the Maximum Contaminant Level (MCL) for drinking water as set by the U.S. Environmental Protection Agency (USEPA). Data from 1989 indicates that agricultural pesticides such as chlordane and lindane at one point were constituents of concern in the watershed; however, after USEPA regulation of these chemicals and Napa County BMPs for vineyards, they are no longer found in the water supply. As shown on **Figure 3-1**, color, turbidity, and iron are the only three constituents that are consistently identified in water quality samples in the Bell Canyon Reservoir.

According to a USEPA document on water quality parameters (USEPA, 1986), objections to high color are generally on aesthetic grounds rather than on the basis of a health hazard. Natural color reflects the presence of complex organic molecules from matter such as leaves and branches. Meanwhile, iron is present in significant amounts in soils and rocks and thus often present in water passing through. There are normally no harmful effects to drinking water with significant amounts of iron. Rather, iron also contributes to effects on aesthetics resulting in added color and turbidity. It should be noted that with implementation of the Proposed Project's ECP, factors such as turbidity (and hence color) from the project site will be reduced from existing conditions. Additionally, the Proposed Project would not affect iron levels in

associated waterways as this is a natural component of rocks and minerals and would be unaffected by the Proposed Project.

As for the Bell Canyon Reservoir, the Proposed Project is in compliance with all County ordinances that were specifically designed to protect sensitive domestic water supply drainages and the associated municipal water supply. According to the City of St. Helena's 2012 Consumer Confidence Report, the "Bell Canyon watershed is small and contains few potential contaminant sources. The land immediately surrounding the reservoir is owned by the City and is thoroughly protected. The most significant sources of contaminants in the watershed are wildfires and development of vineyards. Enlighted vineyard development and erosion control practices continue to have a positive influence on reducing the potential for adverse water quality impacts."

Howell Mountain Mutual Water Company: Friesen Lakes

To the south and east of the property, there are a number of storage ponds and diversion ditches operated by the Howell Mountain Mutual Water Company, which supply drinking water to approximately 400 residences in the town of Angwin. Collectively, these reservoirs are known as the Friesen Lakes. The reservoir on-site known as "No Name Lake" is part of this system, as well as one diversion ditch mapped on the property, beginning just below the reservoir on the eastern edge of parcel APN 018-060-013; this ditch does not convey water in typical conditions and, like the lake, is outside of the project site. There is no direct hydrologic connection between this reservoir within the Friesen Lake system and the project site. The existing reservoir and ditch will be unaffected by the Proposed Project, as both are located upstream of the proposed vineyard blocks and outside of the area of impact.

Drainage

The project site drains to two unnamed tributaries to Bell Creek; consistent with the Hydrologic Analysis conducted for the Proposed Project by O'Connor Environmental, Inc. (OEI) and included here as **Appendix E**, the westernmost tributary will henceforth be referred to as Tributary 1 and the southern tributary will be referred to as Tributary 2. Tributary 1 drains an area of 230± acres, while Tributary 2 has a smaller drainage area of 93± acres (**Appendix E**).

To the east of the property, there are a number of storage ponds and diversion ditches operated by the Howell Mountain Mutual Water Company, which supply drinking water to approximately 400 residences in the town of Angwin. Collectively, these reservoirs are known as the Friesen Lakes. The reservoir onsite is part of this system, as well as one diversion ditch mapped on the property, beginning just below the reservoir on the eastern edge of parcel APN 018-060-013; this ditch does not convey water in typical conditions and is outside of the project site. The existing reservoir and ditch will be unaffected by the Proposed Project, as both are located upstream of the proposed vineyard blocks and outside of the area of impact. There are two

watercourse crossings along Friesen Drive across Class III drainages; one is an existing culvert and the other is a rocked crossing. Neither water crossing would be impacted by the Proposed Project. The rocked low-water crossing currently provides access to the Napa Land Trust property and would provide access to Block A, although it is not anticipated to be used in the winter as there are no erosion control features in Block A that require winter maintenance. Furthermore, there is mitigation in both the EIR (Mitigation Measure 4.6-1) and THP (Mitigation #22) that prohibits winter use of the low-water crossing on the property.

There is an additional concrete slab crossing 1.5 miles south of the property, adjacent to existing vineyards and the Howell Mountain Mutual Water Company's water infrastructure. The existing concrete slab crossing is an approximately 2 foot thick concrete slab that is situated downslope of a privately owned vineyard pond and upslope from a pond owned by the Howell Mountain Mutual Water Company.

Approval of the Proposed Project and implementation of the Erosion Control Plan (ECP) (**Appendix B**) will result in the development of numerous erosion control measures designed to prevent soil erosion and sediment impairment downstream in the Napa River watershed.

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In the Surface Water Quality section (within Section 4.9.1-2), the Nutrients section has been revised as follows:

Nutrients

Nutrients, specifically nitrogen and phosphorus, are essential for life and play a primary role in ecosystem functions. In addition to naturally present concentrations in the atmosphere and organic matter, nutrients are introduced to waterbodies through human or animal waste disposal or agricultural application of fertilizers. Nutrients are commonly the limiting factor for growth in aquatic systems. However, excessive levels of nutrients affect aquatic systems in a wide range of ways, including producing toxic or eutrophic conditions, both of which impair aquatic life. In the 1980s, the ~~The~~ Napa River was ~~is~~ identified as impaired by nutrient loading according to Section 303 (d) of the CWA. However, given improving water quality in the non-tidal portions of the Napa River, the San Francisco Bay RWQCB adopted Resolution No. R2-2014-0006 on February 12, 2014 to delist the non-tidal Napa River for nutrients. It is currently being processed by the U.S. Environmental Protection Agency (USEPA).

Wang et al. (2004) identified numerous nutrient load contributors, including point sources such as wastewater treatment plants, and non-point sources such as septic system seepage, agricultural and urban runoff, and atmospheric deposition. No specific numeric nutrient targets for the Napa River watershed have been established by the SFRWQCB.

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Selected text from **Impact 4.9-2** has been revised as follows:

Impact 4.9-2: Development of the Proposed Project has the potential to alter sedimentation levels in runoff flowing to off-site receiving waters. This is a potentially significant impact. However, as discussed in **Section 4.6**, there will be a decrease in sediment production from the project site with implementation of the ECP and there will be a less-than-significant effect to receiving waters.

As discussed in **Impact 4.9-1**, development of the Proposed Project would alter the existing drainage pattern of property through the removal of existing vegetative land cover, soil ripping and earthmoving activities, and the removal of trees. Alteration of the existing drainage pattern resulting in an increased volume and rate of runoff to these drainages could result in increased loading of sediment and pollutants to onsite drainages, and subsequently offsite streams and the Napa River. However, with implementation of the ECP and the creation of the two attenuation basins as discussed above, runoff from the project site would decrease in rate and volume under post-project conditions (**Appendix E**). Therefore, the Proposed Project would not result in increased accumulation of sediments in receiving waters, increased nutrient loading, or adverse impacts to water temperature.

Sediment Loading

Since the mainstem Napa River has been listed as sediment-impaired according to the Clean Water Act, Section 303 (d), no net increase in sediment yield from the property should be allowed to occur from development of the Proposed Project. As discussed in **Impact 4.6-1**, with incorporation of erosion and runoff control measures proposed in the ECP and discussed above, the overall load of sediment transported to local waterways from the site of the Proposed Project is anticipated to decrease from pre-project conditions. Therefore, implementation of the ECP for the Proposed Project would be beneficial in reducing both offsite onsite erosion and sedimentation loads from contributing to sedimentation entering the Napa River.

<u>During the Pre-Harvest Inspection (PHI) conducted on August 25, 2015, the California Geological Survey (CGS) performed an Engineering Geologic Review of the THP. During this analysis, the length of Friesen Drive was evaluated. According to CGS, the southern concrete slab along Friesen Drive is in good condition and does not appear degraded. In a conversation with CGS, the system manager of the Howell Mountain Mutual Water Company stated that trucks routinely traverse the slab without adverse impact. The manager also indicated he has never witnessed water running over the surface of the slab. Under current conditions, Friesen Drive (and therefore the existing concrete slab crossing) is used by existing vineyard's equipment, Howell Mountain Mutual Water Company, and visitors to the Napa Land Trust's</u>

property, with no adverse impacts to water quality or to overall stability. Thus, the southern concrete slab crossing along Friesen Drive is a less-than-significant impact. In addition, Mitigation Measure 4.6-1 will ensure that there is no increase in erosion due to use of the existing rocked low-water cross on Friesen Drive. Thus, this is a less-than-significant impact. For a more detailed analysis of the project impacts to sediment loading from erosion, refer to **Section 4.6**.

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In Section 4.12.1-1 of the Draft EIR, the capacity of Friesen Drive has been updated as follows:

Typically, the practical capacity of most two-lane rural roadways is 14,000 vehicles per day (HCM, 2000). Given the rural nature of the roadways leading to the project site, the topography or the region, and the relatively minimal existing traffic volumes, the practical capacity for Howell Mountain Road~~,~~ and White Cottage Road~~, and Friesen Drive~~ was assumed for this analysis to be half the typical maximum at 7,000 vehicles per day. Friesen Drive is best categorized a General Minor road that serves primarily as access to adjacent land (Napa County, 2008). Therefore, its practical capacity is up to 1,000 vehicles per day (Napa County, 2011).

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Selected portions of Impact 4.12-2 have been updated with new traffic numbers and assumptions as follows:

Impact 4.12-2: The Proposed Project would increase traffic volumes on roadways in the area during operation of the vineyard development.

Operation of the Proposed Project would generate trips on account of vineyard maintenance and grape harvest. Vineyard operation and maintenance would typically require 3 to 4 people per day or less, but would require up to 10 people for short durations during certain operational tasks, such as pruning or harvest. Operational traffic associated with the Proposed Project would be greatest during harvest of the vineyard. During operation of the Proposed Project, grapes are anticipated be transported in farm trucks to wineries in the Napa Valley area. The grape harvest is expected to be transported over a 30-day harvest period when the vineyard reaches maturity. This type of agricultural traffic anticipated to be generated by the Proposed Project would be minimal and very similar to other agricultural transport activities presently taking place on Friesen Drive. Approximately three 20± ton trucks are anticipated to transport harvested grapes during this 30-day period (**Appendix I**). At worst case scenario, 26 peak day trips would be added to the transportation system.

As discussed in **Section 4.12.1-2**, peak day volume on Friesen Drive is 354 trips (ITE, 2008) and the addition of 26 trips would increase the peak day volumes on Friesen Drive by 7.3 percent. However, given the capacity of Friesen Drive, the addition of 26 trips would still be well below the assumed County maximum capacity of 1,000 vehicles per day for Friesen Drive.

This long-term addition of operational trips to and from Friesen Drive would be minimal, seasonal, and would not exceed capacity on existing roadways serving the property and in the vicinity. Therefore, operation of the Proposed Project would result in a less-than-significant impact to area circulation.

Mitigation Measure 4.12-2: No mitigation is required.

SECTION 5.0

MITIGATION, MONITORING, AND REPORTING PLAN

SECTION 5.0

MITIGATION, MONITORING, AND REPORTING PLAN

5.1 INTRODUCTION

The California Environmental Quality Act (CEQA) requires that a Lead Agency establish a program to report on and monitor measures adopted as part of the environmental review process to mitigate or avoid significant effects on the environment (CEQA *Guidelines* Section 15097). This Mitigation Monitoring and Reporting Plan (MMRP) is designed to ensure that the mitigation measures identified in the Environmental Impact Report (EIR) for the Davis Family, LLC Friesen Vineyards Project (Proposed Project) are fully implemented. The MMRP, as presented in **Table 5-1**, describes the timing/frequency of mitigation implementation responsibilities and standards, and verification of compliance for the mitigation measures identified in the Final EIR.

5.2 MITIGATION, MONITORING, AND REPORTING PLAN

Table 5-1 presents all recommended mitigation measures recommended in the Final EIR, organized by issue area. Various different entities have been assigned monitoring responsibilities under this MMRP. All monitoring actions, once completed, would be reported in writing to CAL FIRE, which would maintain mitigation monitoring records for the Proposed Project. The MMRP will be considered by the Lead Agency, CAL FIRE, and Responsible Agency, Napa County, in conjunction with review and approval of the Proposed Project and each subsequent approval related to project phases [i.e. erosion control plan (ECP), timber harvest plan (THP), timber conversion plan (TCP)], and will be adopted as a condition of project approval for each action and future action.

The components of this table include:

Mitigation Measures: The mitigation measures listed in the Final EIR.

Timing of Action: Identifies the timing for the implementation of each action.

Responsibility for Implementation: Identifies the authority responsible for implementing the mitigation measure.

Responsibility for Monitoring: Identifies the authority responsible for monitoring implementation of the mitigation measure.

Standards for Compliance: Identifies the standard to be met in order for the mitigation measure to be considered implemented, if applicable.

Verification of Compliance: Identifies verification of compliance for each identified mitigation measure. This will be completed by the Lead Agency after mitigation responsibilities have been fulfilled.

TABLE 5-1
MITIGATION MONITORING AND REPORTING PLAN

Mitigation Measure	Timing of Action	Responsible for Implementing	Responsibility for Monitoring	Standards for Compliance	Verification of Compliance
4.3 AIR QUALITY					
Mitigation Measure 4.3-1: The Applicant shall implement a fugitive dust abatement program during the construction of #P13-00373-ECPA to further reduce PM_{10} and $PM_{2.5}$ emissions, which shall include the following elements: ▪ Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard. ▪ Cover all exposed dirt stockpiles. ▪ Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent paved streets. ▪ Limit traffic speeds on unpaved roads to 15 miles per hour (mph). ▪ Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph. In addition to the above measures, the Applicant shall also implement the required basic construction mitigation measures as recommended by the BAAQMD during the construction of the Proposed Project, which shall include the following elements: ▪ All exposed surfaces (e.g., parking areas, staging areas, and unpaved access roads) shall be watered as needed to ensure dust abatement. ▪ Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of the California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. ▪ All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. ▪ Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust	During construction	Applicant	Applicant	Bay Area Air Quality Management District (BAAQMD)	

Mitigation Measure	Timing of Action	Responsible for Implementing	Responsibility for Monitoring	Standards for Compliance	Verification of Compliance
complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations. ▪ All heavy duty construction equipment shall be fitted with diesel particulate matter filters and use only aqueous diesel fuel.					
4.4 BIOLOGICAL RESOURCES					
Mitigation Measure 4.4-1: A Habitat Retention Area (HRA) shall be created on the property that protects oak woodlands via two mechanisms: retention and enhancement. Mitigation for the 5.32 acres of oak woodland impacted by the project at a 2:1 ratio would necessitate 10.6± acres of high value woodland habitat be enhanced and maintained within the property. This HRA is shown in **Figure 4.4-3** (refer to **Section 4** of the Final EIR) and discussed further below. A total of 13.1 acres are included in the HRA; this acreage includes the 3.5± acres of oak woodland habitat that will not be impacted by the Proposed Project. The remaining 9.6± acres of the HRA is comprised of California Foothill Pine Alliance and Chamise Chaparral Alliance that contains scattered black and interior live oaks, and will be enhanced as discussed below. These areas will be protected by a *de facto* conservation easement due to Napa County Ordinance 1219 which adopts Section 18.108.027. *Retention* Avoidance measures would retain areas identified as high value oak woodlands that occur along riparian corridors. Furthermore, oak trees provide slope stability and reduced erosion, particularly on steep slopes (i.e., greater than 30 percent) and near the heads of drainages. A total of 3.5± acres of existing Mixed Oak Alliance within the property shall be retained by means of avoidance to the maximum extent feasible through project design. All avoided trees within 50 feet of ground-disturbing activities shall be protected with visible plastic fencing during all phases of construction activities. Visible fencing shall be placed at the	During construction and operation	Applicant	Applicant/ Qualified forester or arborist	Consistent with Napa County Conservation Guidelines	

Mitigation Measure	Timing of Action	Responsible for Implementing	Responsibility for Monitoring	Standards for Compliance	Verification of Compliance
outside edge of the dripline (edge of the tree canopy) to protect above- and below-ground tissues of these trees and shall be field verified by Napa County prior to the commencement of any grading or vegetation removal. The following shall not occur within the buffers of any retained tree(s): parking or storage of vehicles, machinery, or other equipment; stockpiling of excavated soils, rocks, or construction materials; or dumping of oils or other chemicals. *Enhancement and Restoration* The Oak Enhancement Areas shown in **Figure 4.4-3** contain oaks in the overstory canopy and in the understory canopy. The HRA proposes to reduce competition for the oaks in the understory by removing competition associated with the non-oak trees in the overstory. This will entail removing California foothill pine (*Pinus sabiniana*) and/or chaparral [chamise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos* ssp.), etc.]. This reduction may be in the form of cutting pine into firewood and/or creating standing snags to improve wildlife habitat. This will be done on a site-specific basis as directed by a Registered Professional Forester. This reduction will be accomplished by the use of chainsaws to cut the manzanita and the pine trees. The manzanita will be left in place to provide protective habitat for birds and animals, while the pine will be removed if it can be accessed from the existing road. However, most of it will be felled and/or girdled. Girdling of the pine trees will create snag habitat presently lacking in some areas. No mechanical equipment is allowed in the HRA, except on the existing Friesen Drive. All chainsaw work to reduce overstory competition from the manzanita and pines shall be done during the month of November, with no exceptions. This will allow the operator to easily locate and protect the black oak, as leaves will have begun senescence and should be yellow by then. Operations are also limited to November with the creation of the pine snags. The cooler weather and late season will eliminate potential increases in insect populations associated with the pine. It is anticipated that about 30 percent of the pines will be affected. Reducing the overstory competition will allow the existing oak seedlings to grow; using naturally-established oaks rather than replanting will also ensure higher success rates of mature oaks. At a minimum, a total of 9.6 acres of Oak Enhancement Areas, as					

Mitigation Measure	Timing of Action	Responsible for Implementing	Responsibility for Monitoring	Standards for Compliance	Verification of Compliance
identified on **Figure 4.4-3**, shall receive the treatment described above. This treatment will improve habitat connectivity within the most fragmented habitat areas, thus enhancing the natural habitat and providing increased benefits for wildlife. *Monitoring and Reporting* Restoration and enhancement areas shall be monitored by a qualified botanist or biologist annually for a minimum of five years. Annual monitoring shall be submitted to Napa County by January 1 of each year for five years after the successful completion of the replanting efforts and plan implementation.					
Mitigation Measure 4.4-3: A seed bank retention strategy shall be utilized for the protection of Napa lomatium (*Lomatium repostum*) on the property. Prior to ground disturbing activities, a qualified biologist or botanist shall delineate the extent of the Napa lomatium populations within the clearing limits. All Napa lomatium plants shall be transplanted and the top inch of topsoil shall be skimmed at these locations. The plants and soil shall be moved to the 150-foot buffer zone surrounding the pond in an area that is ecologically suitable for Napa lomatium, as identified by the qualified biologist or botanist. To ensure mitigation success, monitoring by a qualified botanist or biologist shall be performed. Annual monitoring shall be submitted to Napa County by January 1 of each year for five years after the successful completion of the replanting efforts and plan implementation.	During construction	Applicant	Applicant/ Qualified biologist or botanist	Consistent with Napa County Conservation Guidelines	
Mitigation Measure 4.4-4: All information regarding northern spotted owl shall be submitted to CAL FIRE, and annual operations will not commence until CAL FIRE has determined that the project conforms to the USFWS Scenario 3. Protocol survey calling procedures shall follow the revised (January 9, 2012) Protocol for Surveying Proposed Management Activities that may Impact Northern Spotted Owl (USFWS, 2012). The Applicant shall implement the following measures to avoid take of the northern spotted owl (USFWS, 2012): ▪ No timber operations shall occur until all surveys which follow the most current approved USFWS survey protocol for the current, or immediately preceding, survey period are complete; the results have been provided to CAL FIRE to be evaluated for consistency with the plan and protocol; and the results amended into the plan.	During construction	Applicant	Applicant/ Qualified forester or biologist	Consistent with most current NSO survey protocol from US Fish and Wildlife Service (USFWS)	

Mitigation Measure	Timing of Action	Responsible for Implementing	Responsibility for Monitoring	Standards for Compliance	Verification of Compliance
Mitigation Measure 4.4-5: The Applicant shall implement the following measures to avoid disturbing any special status bird species nesting on the project parcel in accordance with the following CDFW-recommended measures: If project activities are scheduled between February 15 and September 15, the following surveys and avoidance measures for nesting birds shall be implemented, as recommended by CDFW. With respect to surveys for nesting bird and raptor species, 1) nest surveys shall be conducted no earlier than 14 days prior to tree removal and/or breaking ground (surveys shall be conducted a minimum of 14 days prior to disturbance), 2) in the event that nesting birds are found, the project applicant shall consult with CDFW and obtain approval for nest-protection buffers prior to tree removal and/or ground disturbing activities, and 3) nest protection buffers shall remain in effect until the young have fledged. All nest protection measures shall apply to off-site impacts and within 500 feet of project activities. If a lapse in project-related work of 15 days or longer occurs, another focused survey and, if required, consultation with CDFW, shall be required before project work can be reinitiated. If active nests are found during a preconstruction survey, 300-foot no-disturbance buffer zones shall be created around active raptor and songbird nests and shall be maintained until it is determined by a qualified biologist that all young have fledged. These buffer zones may be modified in coordination with CDFW based on existing conditions at the project site. Buffer zones shall be fenced with temporary construction fencing and remain in place until the end of the breeding season or until the young have fledged. If a 15-day or greater lapse of project-related work occurs during the breeding season, another bird preconstruction survey and consultation with CDFW will be required before project work can be reinitiated.	During construction	Applicant	Applicant/ Qualified forester or biologist	CDFW	
Mitigation 4.4-6: A qualified biologist shall conduct a habitat assessment for potential suitable habitat (trees with suitable cavities) within the project site no more than three days before project activities commence. If the habitat assessment reveals any suitable cavities, a qualified biologist shall conduct a concentrated presence/absence survey during peak activity periods on each tree with suitable cavities. If bats are found to be present during peak activity periods, then the qualified biologist shall submit an avoidance plan to the County and CDFW for approval. The avoidance plan shall evaluate the length of time disturbance,	During construction	Applicant	Applicant/ Qualified forester or biologist	CDFW	

Mitigation Measure	Timing of Action	Responsible for Implementing	Responsibility for Monitoring	Standards for Compliance	Verification of Compliance
equipment noise, and type of habitat present at the project site. In the event the bat avoidance measures required by CDFW result in a reduction or modification of vineyard block boundaries, the ECP shall be revised by the applicant/engineer and submitted to the County.					
Mitigation Measure 4.4-7: Orange construction fencing shall be placed along the east side of Friesen Drive. Placement of this fencing shall ensure neither construction equipment nor workers will disturb potential western pond turtle habitat associated with the on-site reservoir.	During construction	Applicant	Applicant/ Qualified forester or biologist	CDFW	
Mitigation Measure 4.4-8: Consistent with Scenario IV of the USFWS's *California Red Legged Frog Take Avoidance Scenarios* (March 25, 2008), the Applicant shall implement the following measures for the protection of CRLF: ▪ All suitable habitat must maintain a 30-foot no-cut buffer; no equipment within the no-cut buffer; trees felled away from suitable habitat; ▪ Pile burning must be outside the 300-foot buffer of suitable habitat; ▪ No herbicide use allowed within 300 feet of suitable habitat except for direct application to stumps; ▪ Roads and landings, if constructed, must be at least 300 feet from suitable habitat, and construction must occur in the dry season; ▪ Water drafting from suitable habitat (for dust abatement) must be done with a hose place in a bucket in a deep pool. The bucket must be covered by less than 1-inch mesh, and the mouth of the hose must be covered by 0.25-inch mesh.	During construction	Applicant	Applicant/ Qualified forester or biologist	USFWS	
4.5 CULTURAL RESOURCES					
Mitigation Measure 4.5-1: A qualified archaeologist and Native American representative from the Mishewal-Wappo of Alexander Valley shall be present during ground disturbing activities within the Friesen Site area (CA-NAP-1124) as recommended (Whatford, 2014). Monitors shall be present during work within the site area and up to 25 feet beyond the site boundaries. There is the possibility that potentially important discoveries could be made in this area. In the event that a discovery is made, work should temporarily halt at the place of discovery until the find is evaluated and a plan of treatment is implemented. Additionally, no collection of cultural materials by project personnel shall be allowed.	During construction	Applicant	Applicant	A qualified archaeologist shall verify the find and shall consult with the local CAL FIRE Archaeologist for further guidance.	

Mitigation Measure	Timing of Action	Responsible for Implementing	Responsibility for Monitoring	Standards for Compliance	Verification of Compliance
Mitigation Measure 4.5-2: There is a possibility that unanticipated subsurface archaeological deposits may exist within the proposed vineyard areas, as archaeological sites may be buried with no surface manifestation, or may be obscured by vegetation. In accordance with CEQA Guidelines Section 15064.5 (f), should any previously unknown prehistoric or historic resources, such as, but not limited to, obsidian and chert flaked-stone tools or toolmaking debris; shellfish remains, stone milling equipment, concrete, or adobe footings, walls, filled wells or privies, deposits of metal, glass, and/or ceramic refuse be encountered during onsite construction activities, earthwork within 100 feet of these materials shall be stopped and the Applicant shall consult with a professional archaeologist and tribal representatives, and the provisions of 14 CCR 929.3 shall be applied. Once the archaeologist has had the opportunity to evaluate the find he/she shall consult the local California Department of Forestry and Fire Protection (CAL FIRE) Archaeologist regarding the results of the evaluation and appropriate site treatment options, as necessary. Said measures shall be carried out prior to any resumption of related ceased earthwork. All significant cultural resource materials recovered shall be subject to scientific analysis, professional museum curation, and a report prepared by the qualified archaeologist according to current professional standards and a copy of the draft report provided to the local CAL FIRE Archaeologist for review and approval prior to finalization of it.	During construction	Applicant	Applicant	A qualified archaeologist shall verify the find and shall consult with the local CAL FIRE Archaeologist for further guidance.	
Mitigation Measure 4.5-3: In the event that human remains are discovered, the provisions of the California Health and Safety Code Section 7050.5 (b) shall be followed, including contacting the Napa County Coroner within 24 hours of the find. Upon determining the remains as being Native American in origin, the Coroner would be responsible for contacting the NAHC within 24 hours. The NAHC has various powers and duties to provide for the ultimate disposition of any Native American remains, as does the assigned Most Likely Descendant (MLD), who is designated by the NAHC.	During construction	Applicant	Applicant	California Health and Safety Code Section 7050.5 (b)	
4.6 GEOLOGY AND SOILS					
Mitigation Measure 4.6-1: With full implementation of the ECP (**Appendix B**) and the implementation of the erosion control measures in the THP (**Appendix H**), no further mitigation is required to reduce erosion from vineyard blocks. To reduce the potential for erosion due to use of the rocked low-water crossing on Friesen Drive, the following measures shall be implemented:	During construction	Applicant	Applicant	N/A	

Mitigation Measure	Timing of Action	Responsible for Implementing	Responsibility for Monitoring	Standards for Compliance	Verification of Compliance
▪ Use of the low water crossing is limited to pickup trucks and or cars during the winter period. ▪ No heavy equipment is allowed to use the crossing if there is water flow. ▪ No material, vegetative or otherwise may be dragged through the crossing at any time, wet or dry. ▪ All vegetation will be transported, if needed, by 10 wheel dump trucks to landings east of the low water crossing. ▪ No modification of the existing crossing is permitted at any time.					
Mitigation Measure 4.6-2: The recommendations found in the engineering geological and geological technical investigation shall be implemented, including: ▪ On the rock disposal area typical detail, the note for the keyway should specify a minimum embedment of 12 inches into firm soil or bedrock.	During construction	Applicant	Applicant	Engineering Geological and Geological Technical Investigation	
4.7 GREENHOUSE GAS EMISSIONS					
Mitigation Measure 4.7-1: The Applicant shall implement the following mitigation measures to reduce criteria pollutant emissions during construction of the Proposed Project: • The Applicant shall maintain all construction equipment in accordance with manufacturers' specifications. • The Applicant shall limit construction equipment idling time to less than five minutes.	During construction	Applicant	Applicant	BAAQMD	
4.8 HAZARDOUS MATERIALS					
Mitigation Measure 4.8-1: In addition to the erosion control measures described in **Section 3.0**, personnel shall follow written BMPs for filling and servicing construction equipment and vehicles. The BMPs, which are designed to reduce the potential for incidents involving hazardous materials, shall include: ▪ Refueling shall be conducted only with approved pumps, hoses, and nozzles. ▪ Catch-pans shall be placed under equipment to catch potential spills during servicing. ▪ All disconnected hoses shall be placed in containers to collect residual fuel from the hose. ▪ Vehicle engines shall be shut down during refueling. ▪ No smoking, open flames, or welding shall be allowed in refueling or service areas.	During construction	Applicant	Applicant	Consistent with California Department of Toxic Substance Control guidance	

Mitigation Measure	Timing of Action	Responsible for Implementing	Responsibility for Monitoring	Standards for Compliance	Verification of Compliance
▪ Refueling and all construction work shall be performed outside of any onsite stream buffer zones to prevent contamination of water in the event of a leak or spill. ▪ Service trucks shall be provided with fire extinguishers and spill containment equipment, such as absorbents. ▪ A spill containment kit that is recommended by the Napa County PBES or local fire department will be onsite and available to staff if a spill occurs. In the event that contaminated soil and/or groundwater or other hazardous materials are generated or encountered during construction, all work shall be halted in the affected area and the type and extent of the contamination shall be determined. Should a spill contaminate soil, the soil shall be put into containers and disposed of in accordance with federal, state, and local regulations. If containment and size of the spill is beyond the scope of the contractor, proper authorities shall be notified.					
Mitigation Measure 4.8-2: In the event pesticides are used onsite, only a certified pest applicator shall apply the pesticides and personnel shall follow Standard Operating Procedures (SOPs) when applying chemicals to the vineyard. SOPs for pesticide use, shall include the following: ▪ Purchase only enough pesticide that would be used per season. ▪ All chemicals will be stored in their original containers. Labels on the containers will not be removed. ▪ Chemicals will be kept in a well-ventilated locked area. ▪ Chemical storage areas will be 100 feet from any drainage area, stream, or groundwater well. ▪ If a chemical must be disposed of, contact the Napa County Agricultural Commissioner to locate a hazardous waste facility for proper disposal. ▪ Chemicals will never be poured down the sink, toilet, or stream. ▪ Proper personal protection equipment will be utilized when working with chemicals.	During construction	Applicant	Applicant	Consistent with California Department of Toxic Substance Control guidance	
Mitigation Measure 4.8-3: In addition to **Mitigation Measures 4.8-1** and **4.8-2**, fuel loading and chemical mixing areas during operation should be established away from any areas that could potentially drain off-site or potentially affect surface and groundwater quality. When farm equipment is cleaned at the	During construction and operation	Applicant	Applicant	Consistent with California Department of Toxic Substance Control guidance	

Mitigation Measure	Timing of Action	Responsible for Implementing	Responsibility for Monitoring	Standards for Compliance	Verification of Compliance
existing facility, only rinse water that is free of gasoline residues, waste oils, pesticides, and other chemicals should be allowed to diffuse back into vineyard areas. In the event pesticides, herbicides or fungicides are used, all rinse water from farm equipment and rinse water from application equipment used to apply chemicals should be collected and stored in containers that are of sufficient size to contain the water until a hazardous materials transporter can remove the rinse water. No rinse water shall be drained to a septic system or discharged to ground or surface water to prevent the release of hazardous materials into the environment during operation and maintenance of the Proposed Project.					
4.12 TRANSPORTATION AND CIRCULATION					
Mitigation Measure 4.12-1: The following mitigation measures provided in the Timber Conversion Plan (**Appendix I**) shall be required for construction vehicles using off-site roadways during construction activities. ▪ All oversized construction vehicles are advised to use extreme caution when transporting milled lumber along county roads, especially in areas of limited site visibility. ▪ Oversized construction vehicles are to operate with headlights on for safety and are not to exceed 15 miles per hour on Friesen Drive, and 25 miles per hour while on rural county roads. ▪ Oversized vehicles are not to use Jake brakes in the immediate vicinity of residential neighborhoods. ▪ All construction activities are restricted to Monday through Saturday 7 am to 7 pm. No activities may take place on Sundays and holidays. ▪ Heavy equipment and material delivery and removal will be limited to non-peak hours (9 AM to 4 PM) and will be maintained and/or stock piled onsite to avoid multiple in and out trips to the extent practical and feasible.	During construction	Applicant	Applicant	N/A	

APPENDICES

APPENDIX F

EROSION ASSESSMENT
(REPRINTED WITH ATTACHMENTS)

Erosion Assessment
Davis Family Estate
Friesen Vineyard

by

O'Connor Environmental, Inc.
P.O. Box 794, Healdsburg, CA 95448

Matt O'Connor, PhD, CEG #2449

June 2014
Revised April 2015

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Appendix A - USLE Analyses Provided by Napa Valley Vineyard Engineering

Overview

This assessment addresses the requirement that the Davis Family Estate Friesen Vineyard Erosion Control Plan (prepared by Napa Valley Vineyard Engineering) satisfy County of Napa General Plan land use Policy CON-48:

> *Proposed developments shall implement project-specific sediment and erosion control measures (e.g., erosion control plans and/or stormwater pollution prevention plans) that maintain pre-development sediment erosion conditions or at minimum comply with state water quality pollution control (i.e., Basin Plan) requirements and are protective of the County's sensitive domestic supply watersheds.*

This erosion assessment benefits from our prior analysis of hydrology and peak runoff for this Project. The hydrologic analysis (prepared by O'Connor Environmental, Inc.) supplemented the Erosion Control Plan (ECP) in that it provided guidance regarding the need for and design of on-site runoff detention basins. It also familiarized us with site runoff characteristics and erosion processes under both existing and proposed Project conditions.

The following assessment first describes general site characteristics considered, including precipitation, geology, soils and vegetation. Specific erosion processes expected to be relevant for the project area then considered, followed by a review of the USLE erosion estimates prepared for the ECP by Napa Valley Vineyard Engineering. Finally, major features of the ECP that control soil loss from the site not accounted for in the USLE calculations are described. The ultimate conclusion of this assessment is that post-project erosion rates will be reduced relative to existing conditions.

Site Characteristics

This site is comprehensively characterized for purposes of the California Environmental Quality Act (CEQA) in a series of separate analyses compiled in the Project Environmental Impact Report. A brief summary of characteristics pertaining to precipitation, geology, soils, and vegetation are presented in the following section.

Precipitation

The Napa County Soil Survey isohyetal map of mean annual precipitation indicates that the site receives 45 to 50 inches of precipitation. More recent data (PRISM Climate Group, Oregon State University, 2013) estimates that for the period 1981 to 2010, annual rainfall was 36 to 40 inches. In either case, this ridge top upland area receives high amounts of rainfall relative to most of Napa County.

Rainfall intensity for 24 hour duration storms ranging from 2- to 100-year recurrence intervals are reported in the hydrologic analysis.

Geology

The site is underlain by various units of the Tertiary-age Sonoma Volcanics[1]. The proposed vineyard blocks lie atop rocks mapped as pumiceous ash-flow tuff (map unit Tst), which is comprised of locally welded and aglomeratic tuff, andesite and basalt flow rocks. The slopes above the vineyard blocks are primarily tuff of similar character to Tst, but thinly interbedded with basalt or andesite flows (map unit Tsft). The lower- most portions of the site, possibly including the southern portion of Block C and southwest edge of Block D, are mapped as rhyolite flows with intercalcated rhyolite tuff in places (map unit Tsr). Field observations of the site generally confirm the foregoing description, with significant exposures of tuff visible along Friesen Road and volcanic bedrock (andesite, basalt or rhyolite) exposed in the stream bed between Blocks C and D.

With respect to erosion processes, the relevant characteristics of bedrock geology are that much of the site has bedrock exposed at or near the surface, overlain by relatively thin soils. These characteristics would be expected to produce relatively high rates of surface runoff under existing conditions.

Soils

The Napa County Soil Survey indicates that most of the soil unit on the site is “Rock outcrop-Kidd complex 50-75% slopes” (soil unit 177) with a narrow strip of “Forward gravelly loam 2 to 9% slopes” (soil unit 138) along the western edge of Blocks A, B and C as shown on the Erosion Control Plan (Sheet 2). The Forward soil is typically 35 inches deep. Within soil unit 177, 70% of the unit is expected to be rock outcrop and 25% of the unit is expected to be Kidd loam 15 to 30% slopes”. The Kidd soil is typically about 14 inches deep. Field observations suggest that although soils are generally thin, the proportion of rock outcrop on the ground surface in the proposed vineyard area is much less than 70%.

Vegetation

Vegetation cover at the project site has considerable variability, but is mostly dense brush (e.g. manzanita) with scattered hardwoods and digger pines and grassy or bare understory. The most concentrated forest stand, including conifers, is located in the southwest portion of Block C. Another smaller area dominated by forest canopy is located along the west edge of Block B. For purposes of USLE calculations, the vineyard blocks were considered to be 25% “woods” and 75% “brush” with a mixture of grasses and weeds in the understory.

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[1] Graymer, RW et al. (2007) Geologic Map and Map Database of Eastern Sonoma and Western Napa Counties, California. US Geological Survey Scientific Investigations Map 2958.

Erosion Processes

Observations at the project site indicated limited erosion from the project site. In locations where concentrated surface runoff occurs, erosion and sedimentation occurs. Vegetation cover in areas dominated by brush is limited in that there is very little understory (grasses); in these areas, organic litter is present to reduces the energy of raindrop impacts, but shallow surface root systems (e.g. grass roots) are not common leaving the soil surface potentially vulnerable to surface erosion. Given the extent of rock outcrops and shallow soil, it is likely that surface runoff would occur during relatively intense rainstorms that would be capable of eroding surface soil where runoff concentrates.

Erosion of stream beds and banks was observed in the short reach of stream that passes between Block A and B. The contributing drainage area for this stream is predominantly from offsite. A discontinuous ephemeral channel was observed along the eastern edge of this channel from proposed vineyard Block B. Erosion of alluvium in the stream bed and soil and alluvium in stream banks in this channel is controlled by runoff from offsite.

Bed and banks of two other streams draining from the southern portion of the project site are dominated by bedrock. The stream channel that separates proposed vineyard Blocks C and D is relatively steep, very well armored by bedrock in both bed and banks, and has generally small patches of sediment deposits in the stream bed. The stream channel lying on the southeast edge of proposed vineyard Block D has abundant bedrock and boulders in the bed and banks, but has larger and more frequent patches of sediment deposited on the stream bed. Neither of these channels are vulnerable to bed and bank erosion.

Concentrated runoff from Friesen Road enters the project site from the inboard road drainage ditch at two points via two culverts. An additional culvert is proposed to be placed between the two existing culverts adjacent to vineyard block C. The addition of this culvert is expected to reduce the amount of concentrated flows entering the project site through each culvert therefore decreasing potential for erosion. The quantity of sediment transported in these ditches is relatively small because the road ditches and cut slopes are hewn into tuff bedrock hence there is little potential erosion of the ditch. Runoff from hillslopes above and from the road surface are the primary sources of sediment transported through the road ditches.

No evidence of mass wasting (landslides) was observed on this site during field reconnaissance and in review of aerial imagery.

Soil Loss Estimate

County of Napa procedures for vineyard development specify that the Universal Soil Loss Equation (USLE) as adapted for vineyards[2] be used to estimate soil loss from the project site's proposed vineyard fields. Tables summarizing the USLE calculations for the project site prepared by Napa Valley Vineyard Engineering for existing site conditions and proposed project conditions are attached in Appendix A. Blocks A, C and D are represented by a single representative hillslope profile. Block B has more variable slope lengths and is represented by four representative hillslope profiles.

USLE parameters rainfall erosivity (R), soil erosiveness (K), slope length, gradient (S), calculated length-slope factor (LS), soil cover (C) and management practice (P) are multiplied together to produce an estimate of erosion rate (tons/acre/year). In the post-project environment, the cover (C) and management practice (P) factors are determined by provisions of the ECP. Specifically, vineyard cover crops with spot spraying along vine rows will maintain 80% soil cover and, in proposed Block D, vine rows are oriented substantially across the vineyard slope, introducing a P factor of 0.6. In the other proposed blocks, the vine rows are oriented substantially up-and-down hill, and the P factor is 1.0.

The result of the USLE analysis prepared for the ECP is summarized in Table 1. The erosion rate predicted for each vineyard block in pre- and post-project conditions is multiplied by gross acreage in each block to estimate annual erosion in each block. The erosion rates in Table 1 for Blocks B and C are the mean of two separate calculations for representative transects within the blocks. For Block B rates are 9.34 and 10.46 t/ac/yr under pre-project conditions and 4.1 and 4.59 t/ac/yr for post-project conditions. For Block C rates are 1.96 and 2.33 t/ac/yr under pre-project conditions and 1.36 and 1.02 t/ac/yr for post-project conditions(see Appendix A). Post-project conditions are expected to reduce surface erosion from about 63t/yr to about 30 t/yr, a decline of over 50%.

Table 1-Summary of Project Site Erosion Analysis (USLE)

Vineyard Area		USLE Erosion Rate (t/ac/yr)		Erosion (t/yr)	
Block	Gross acres	Pre-project	Post-project	Pre-project	Post-project
A	0.54	0.45	0.34	0.24	0.19
B	2.91	9.9	4.34	28.8	12.64
C	7.50	2.15	1.19	16.09	8.93
D	2.78	6.42	2.82	17.86	7.83
			Total	62.9	29.6

[2] USDA Natural Resources Conservation Service (1994). The Universal Soil Loss Equation USLE. Special Applications for Napa County, California. May, 1994. 17 pages.

Supplemental Control of Off-site Sediment Delivery

The project ECP includes two features that are expected to further reduce sediment delivery from the site. First, substantial rock-disposal structures border downslope portions of the perimeters of Blocks B, C and D adjacent to each of the major stream-side setbacks. The design of these rock-disposal structures will provide significant sediment retention potential. In addition, these structures will also provide substantial function as flow spreaders. Additionally, the undisturbed soil and vegetation within streamside setbacks will provide an additional deposition zone within which sediment potentially mobilized within vineyard blocks may be deposited prior to reaching a stream channel. The significant features of the ECP are expected to provide substantial supplemental reduction in sediment delivery from the project site.

Summary and Conclusion

The preceding summary of site conditions, erosion processes, and erosion control measures embodied in the project ECP demonstrates that this project complies with County of Napa County land use Policy CON-48. Erosion rates on the project site are expected to be reduced relative to existing conditions and potential for off-site transport of eroded sediment are substantially reduced.

	Napa Valley Vineyard Engineering										
	Post Project USLE Worksheet R2										
FOR:	Davis Family Estate										
DATE:	2/18/2015										
	Ranch:	Friesen Vineyard									
	SOIL TYPE:	177 Rock outcrop, Kidd									
			Transect C1		Transect C2		Transect D				
# /ACRES:		2.65	Block C	4.85	Block C	2.78	Block D				
FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
R	Rainfall	110		110		110					
K	Soil Erosiveness	0.28		0.28		0.28					
	Slope length (ft)	229		180		289					
S	Gradient	9.0		8.0		14.0					
LS	Calculated LS	1.77		1.33		3.66		0.00		0.00	
C	Cover	0.025		0.025		0.025					
P	Practice	1		1		1					
A	Soil loss, tons/acre	1.36		1.02		2.82		0.00		0.00	
A	Soil loss, tons	3.61		4.96		7.83		0.00		0.00	
		80% cover		80% cover		80% cover					
		Alt-row till		Alt-row till		Alt-row till					
	A=(R) (K) (LS) (C) (P)		Note: Broadcasting seed and straw mulch at 2 tons/ac before winter								
	Cover:	Alternate middles, no till @ 80%					(0.50)(.022)=	0.011			
		Alternate middles, till, seed, mulch @ 80%					(0.50)(.028)=	0.014			
							Weighted Avg C=	0.025			
								Total Soil Loss Post Project = 29.4 tons			

	Napa Valley Vineyard Engineering										
	Post Project USLE Worksheet R2										
FOR:	Davis Family Estate										
DATE:	2/18/2015										
	Ranch:	Friesen Vineyard									
	SOIL TYPE:	138 Forward;		177 Rock outcrop, Kidd							
			Transect A		Transect B1		Transect B2				
# /ACRES:		0.54	Block A	1.10	Block B	1.81	Block B				
FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
R	Rainfall	110		110		110					
K	Soil Erosiveness	0.17		0.28		0.28					
	Slope length (ft)	55		361		293					
S	Gradient	8.0		17.0		20.0					
LS	Calculated LS	0.73		5.32		5.96		0.00		0.00	
C	Cover	0.025		0.025		0.025					
P	Practice	1		1		1					
A	Soil loss, tons/acre	0.34		4.10		4.59		0.00		0.00	
A	Soil loss, tons	0.19		4.51		8.30		0.00		0.00	
		80% cover		80% cover		80% cover					
		Alt-row till		Alt-row till		Alt-row till					
	A=(R) (K) (LS) (C) (P)		Note: Broadcasting seed and straw mulch at 2 tons/ac before winter								
	Cover:	Alternate middles, no till @ 80%					(0.50)(.022)=	0.011			
		Alternate middles, till, seed, mulch @ 80%					(0.50)(.028)=	0.014			
							Weighted Avg C=	0.025			

	Napa Valley Vineyard Engineering										
	Pre Project USLE Worksheet R2										
FOR:	Davis Family Estate										
DATE:	2/18/2015										
	Ranch:	Friesen Vineyard									
	SOIL TYPE:	177 Rock outcrop, Kidd									
			Transect C1		Transect C2		Transect D				
# /ACRES:		2.65	Block C	4.85	Block C	2.78	Block D				
FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
R	Rainfall	110		110		110					
K	Soil Erosiveness	0.28		0.28		0.28					
	Slope length (ft)	229		180		289					
S	Gradient	9.0		8.0		14.0					
LS	Calculated LS	1.77		1.33		3.66		0.00		0.00	
C	Cover	0.036		0.057		0.057					
P	Practice	1		1		1					
A	Soil loss, tons/acre	1.96		2.33		6.42		0.00		0.00	
A	Soil loss, tons	5.20		11.31		17.86					
		Transect C1					**Transect C2**				
		50% Brush with 70% Ground Cover					50% Trees with 60% Ground Cover				
	A=(R) (K) (LS) (C) (P)	70% Grass		(0.70)(.025)=	0.0175		60% Grass		(0.60)(.040)=	0.024	
		30% Broadleaf Cover		(0.30)(.0615)=	0.01845		40% Broadleaf Cover		(0.40)(.087)=	0.0348	
				Weighted Avg C=	0.03595				Weighted Avg C=	0.0588	
				Transect D							
				75% Trees with 60% Ground Cover							
				60% Grass		(0.60)(.039)=	0.0234				
				40% Broadleaf Cover		(0.40)(.084)=	0.0336				
						Weighted Avg C=	0.057				
								Total Soil Loss Pre Project = 63.81 tons			

	Napa Valley Vineyard Engineering										
	Pre Project USLE Worksheet R2										
FOR:	Davis Family Estate										
DATE:	2/18/2015										
	Ranch:	Friesen Vineyard									
	SOIL TYPE:	138 Forward;		177 Rock outcrop, Kidd							
			Transect A		Transect B1		Transect B2				
# /ACRES:		0.54	Block A	1.10	Block B	1.81	Block B				
FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
R	Rainfall	110		110		110					
K	Soil Erosiveness	0.17		0.28		0.28					
	Slope length (ft)	55		361		293					
S	Gradient	8.0		17.0		20.0					
LS	Calculated LS	0.73		5.32		5.96		0.00		0.00	
C	Cover	0.033		0.057		0.057					
P	Practice	1		1		1					
A	Soil loss, tons/acre	0.45		9.34		10.46		0.00		0.00	
A	Soil loss, tons	0.24		10.27		18.93		0.00		0.00	
			Transect A					**Transect B1 thru B2**			
	A=(R) (K) (LS) (C) (P)		75% Trees with 70% Ground Cover					75% Trees with 60% Ground Cover			
			80% Grass		(0.80)(.026)=	0.0204		60% Grass		(0.60)(.039)=	0.0234
			20% Broadleaf Cover		(0.20)(.065)=	0.0125		40% Broadleaf Cover		(0.40)(.084)=	0.0336
					Weighted Avg C=	0.0329				Weighted Avg C=	0.057

APPENDIX P

BELL CANYON WATERSHED DATA

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	8/8/2012	TOTAL ORGANIC CARBON (TOC)	4.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/11/2012	TOTAL ORGANIC CARBON (TOC)	4.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/13/2012	TOTAL ORGANIC CARBON (TOC)	4.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2012	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/11/2012	TOTAL ORGANIC CARBON (TOC)	5.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	PERCHLORATE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	SPECIFIC CONDUCTANCE	230	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/5/2012	COLOR	**90**	15	CU
BELL CANYON RESERVOIR INTAKE	4/5/2012	ODOR THRESHOLD @ 60 C	1	3	TON
BELL CANYON RESERVOIR INTAKE	4/5/2012	SPECIFIC CONDUCTANCE	62	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/5/2012	PH, LABORATORY	7.16	-	-
BELL CANYON RESERVOIR INTAKE	4/5/2012	ALKALINITY (TOTAL) AS CaCO3	22	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	BICARBONATE ALKALINITY	27	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	CARBONATE ALKALINITY	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	HARDNESS (TOTAL) AS CACO3	18	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	CALCIUM	4.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	MAGNESIUM	1.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	SODIUM	4.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	CHLORIDE	3.5	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	SULFATE	2.6	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	FLUORIDE (F) (NATURAL-SOURCE)	0.15	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	IRON	**630**	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	MANGANESE	20	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	ALUMINUM	660	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	METHYL-TERT-BUTYL-ETHER (MTBE)	3	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	TOTAL DISSOLVED SOLIDS	85	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	GLYPHOSATE	10	700	ug/L
BELL CANYON RESERVOIR INTAKE	4/5/2012	TURBIDITY, LABORATORY	**11**	5	NTU
BELL CANYON RESERVOIR INTAKE	4/5/2012	AGGRSSIVE INDEX (CORROSIVITY)	9.51	-	0
BELL CANYON RESERVOIR INTAKE	3/14/2012	TOTAL ORGANIC CARBON (TOC)	5.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/8/2012	TOTAL ORGANIC CARBON (TOC)	4.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	1/11/2012	TOTAL ORGANIC CARBON (TOC)	3.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	12/14/2011	TOTAL ORGANIC CARBON (TOC)	4	-	mg/L
BELL CANYON RESERVOIR INTAKE	11/9/2011	TOTAL ORGANIC CARBON (TOC)	3.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/12/2011	TOTAL ORGANIC CARBON (TOC)	4	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	2-CHLOROTOLUENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	4-CHLOROTOLUENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	N-BUTYLBENZENE	0.5	-	ug/L

Data from State Water Resources Control Board, Division of Drinking Water

Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	10/4/2011	P-ISOPROPYLTOLUENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	BROMOCHLOROMETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	M,P-XYLENE	0.5	1750	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	BROMODICHLORMETHANE (THM)	0.5	80	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	CARBON TETRACHLORIDE	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	BROMOFORM (THM)	0.5	80	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	DIBROMOCHLOROMETHANE (THM)	0.5	80	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	CHLOROFORM (THM)	0.5	80	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	TOLUENE	0.5	150	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	BENZENE	0.3	1	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	ACRYLONITRILE	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	MONOCHLOROBENZENE	0.5	70	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	CHLOROETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	ETHYLBENZENE	0.5	300	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	HEXACHLOROBUTADIENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	BROMOMETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	CHLOROMETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	DICHLOROMETHANE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	TETRACHLOROETHYLENE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	TRICHLOROFLUOROMETHANE	0.5	150	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,1-DICHLOROETHANE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,1-DICHLOROETHYLENE	0.3	6	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,1,1-TRICHLOROETHANE	0.5	200	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,1,2-TRICHLOROETHANE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,1,2,2-TETRACHLOROETHANE	0.5	1	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,2-DICHLOROETHANE	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,2-DICHLOROBENZENE	0.5	600	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,2-DICHLOROPROPANE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	TRANS-1,2-DICHLOROETHYLENE	0.5	10	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,2,4-TRICHLOROBENZENE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,3-DICHLOROPROPENE (TOTAL)	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,3-DICHLOROBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,4-DICHLOROBENZENE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	DICHLORODIFLUOROMETHANE (FREON 12)	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	NAPHTHALENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	TRANS-1,3-DICHLOROPROPENE	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	CIS-1,3-DICHLOROPROPENE	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	VINYL CHLORIDE	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	TRICHLOROETHYLENE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	METHYL-TERT-BUTYL-ETHER (MTBE)	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	NITRATE (AS NO3)	1	45	mg/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	CARBON DISULFIDE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	CIS-1,2-DICHLOROETHYLENE	0.5	6	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	STYRENE	0.5	100	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	O-XYLENE	0.5	1750	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,1-DICHLOROPROPENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	2,2-DICHLOROPROPANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,3-DICHLOROPROPANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,2,4-TRIMETHYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	ISOPROPYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1-PHENYLPROPANE (N-PROPYLBENZENE)	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,3,5-TRIMETHYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	SEC-BUTYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	TERT-BUTYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,1,1,2-TETRACHLORETHANE	0.5	-	ug/L

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	10/4/2011	DIBROMOMETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,2,3-TRICHLOROBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	XYLENES (TOTAL)	0.5	1750	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	ACETONE	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	BROMOBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	METHYL ETHYL KETONE	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	METHYL ISOBUTYL KETONE	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.5	1200	ug/L
BELL CANYON RESERVOIR INTAKE	10/4/2011	TOTAL TRIHALOMETHANES	0.5	80	ug/L
BELL CANYON RESERVOIR INTAKE	9/14/2011	TOTAL ORGANIC CARBON (TOC)	3.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	8/10/2011	TOTAL ORGANIC CARBON (TOC)	4.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/13/2011	TOTAL ORGANIC CARBON (TOC)	3.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/11/2011	TOTAL ORGANIC CARBON (TOC)	4	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2011	GLYPHOSATE	25	700	ug/L
BELL CANYON RESERVOIR INTAKE	4/13/2011	TOTAL ORGANIC CARBON (TOC)	3.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	PERCHLORATE	4	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	COLOR	**40**	15	CU
BELL CANYON RESERVOIR INTAKE	4/6/2011	ODOR THRESHOLD @ 60 C	1	3	TON
BELL CANYON RESERVOIR INTAKE	4/6/2011	SPECIFIC CONDUCTANCE	400	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/6/2011	PH, LABORATORY	7.12	-	-
BELL CANYON RESERVOIR INTAKE	4/6/2011	ALKALINITY (TOTAL) AS CaCO3	21	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	BICARBONATE ALKALINITY	200	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	CARBONATE ALKALINITY	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	HARDNESS (TOTAL) AS CACO3	17	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	CALCIUM	4	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	MAGNESIUM	1.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	SODIUM	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	CHLORIDE	3.7	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	SULFATE	2.5	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	IRON	**530**	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	MANGANESE	20	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	ALUMINUM	740	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	METHYL-TERT-BUTYL-ETHER (MTBE)	3	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	TOTAL DISSOLVED SOLIDS	74	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/6/2011	TURBIDITY, LABORATORY	**6.9**	5	NTU
BELL CANYON RESERVOIR INTAKE	4/6/2011	AGGRSSIVE INDEX (CORROSIVITY)	9.44	-	0
BELL CANYON RESERVOIR INTAKE	3/9/2011	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/9/2011	TOTAL ORGANIC CARBON (TOC)	4.7	-	mg/L

Data from State Water Resources Control Board, Division of Drinking Water

Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	1/12/2011	TOTAL ORGANIC CARBON (TOC)	4.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	12/8/2010	TOTAL ORGANIC CARBON (TOC)	4.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	11/10/2010	TOTAL ORGANIC CARBON (TOC)	4.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/13/2010	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	9/8/2010	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	8/11/2010	TOTAL ORGANIC CARBON (TOC)	4.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/15/2010	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/2010	TOTAL ORGANIC CARBON (TOC)	4.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/2010	TOTAL ORGANIC CARBON (TOC)	4.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/6/2010	NITRATE (AS NO3)	0	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2010	TOTAL ORGANIC CARBON (TOC)	4.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	COLOR	**35**	15	CU
BELL CANYON RESERVOIR INTAKE	4/7/2010	ODOR THRESHOLD @ 60 C	1	3	TON
BELL CANYON RESERVOIR INTAKE	4/7/2010	SPECIFIC CONDUCTANCE	72	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/7/2010	PH, LABORATORY	7.11	-	-
BELL CANYON RESERVOIR INTAKE	4/7/2010	ALKALINITY (TOTAL) AS CaCO3	25	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	BICARBONATE ALKALINITY	30	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	CARBONATE ALKALINITY	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	NITRITE (AS N)	200	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	HARDNESS (TOTAL) AS CACO3	21	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	CALCIUM	4.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	MAGNESIUM	2.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	SODIUM	6.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	CHLORIDE	4.1	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	SULFATE	2.8	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	IRON	**370**	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	MANGANESE	23	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	ALUMINUM	440	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	FOAMING AGENTS (MBAS)	0.056	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	TOTAL DISSOLVED SOLIDS	57	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	GLYPHOSATE	10	700	ug/L
BELL CANYON RESERVOIR INTAKE	4/7/2010	TURBIDITY, LABORATORY	3.9	5	NTU
BELL CANYON RESERVOIR INTAKE	4/7/2010	AGGRSSIVE INDEX (CORROSIVITY)	9.6	-	0
BELL CANYON RESERVOIR INTAKE	3/10/2010	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/10/2010	TOTAL ORGANIC CARBON (TOC)	5.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	1/13/2010	TOTAL ORGANIC CARBON (TOC)	4.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	12/10/2009	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/14/2009	TOTAL ORGANIC CARBON (TOC)	5.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	9/9/2009	TOTAL ORGANIC CARBON (TOC)	5.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	8/12/2009	TOTAL ORGANIC CARBON (TOC)	4.7	-	mg/L

Data from State Water Resources Control Board, Division of Drinking Water

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Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	7/8/2009	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/2009	TOTAL ORGANIC CARBON (TOC)	4.2	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/20/2009	TOTAL ORGANIC CARBON (TOC)	4.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/21/2009	GLYPHOSATE	10	700	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	PERCHLORATE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	SPECIFIC CONDUCTANCE	68	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/14/2009	COLOR	**55**	15	CU
BELL CANYON RESERVOIR INTAKE	4/14/2009	ODOR THRESHOLD @ 60 C	1.6	3	TON
BELL CANYON RESERVOIR INTAKE	4/14/2009	SPECIFIC CONDUCTANCE	71	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/14/2009	PH, LABORATORY	7.11	-	-
BELL CANYON RESERVOIR INTAKE	4/14/2009	ALKALINITY (TOTAL) AS CaCO3	25	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	BICARBONATE ALKALINITY	30	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	CARBONATE ALKALINITY	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	HARDNESS (TOTAL) AS CACO3	19	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	CALCIUM	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	MAGNESIUM	1.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	SODIUM	5.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	CHLORIDE	3.8	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	SULFATE	2.9	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	ARSENIC	0.55	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	BARIUM	20	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	BERYLLIUM	0.1	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	CADMIUM	0.1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	CHROMIUM (TOTAL)	0.5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	COPPER	8.1	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	IRON	**350**	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	MANGANESE	9.9	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	THALLIUM	0.1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	NICKEL	0.5	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	SILVER	0.1	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	ZINC	22	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	ANTIMONY	0.5	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	ALUMINUM	370	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	SELENIUM	1	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	METHYL-TERT-BUTYL-ETHER (MTBE)	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	TOTAL DISSOLVED SOLIDS	48	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	NITRATE (AS NO3)	1	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/14/2009	TURBIDITY, LABORATORY	3.5	5	NTU
BELL CANYON RESERVOIR INTAKE	4/14/2009	AGGRSSIVE INDEX (CORROSIVITY)	9.55	-	0
BELL CANYON RESERVOIR INTAKE	4/8/2009	TOTAL ORGANIC CARBON (TOC)	5.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	3/11/2009	TOTAL ORGANIC CARBON (TOC)	5.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	ENDOTHALL	0	100	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	THIOBENCARB	1	70	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	ALDICARB SULFOXIDE	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	ALDICARB SULFONE	4	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	3-HYDROXYCARBOFURAN	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	DCPA (TOTAL DI & MONO ACID DEGRADATES)	0.2	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	4-NITROPHENOL	0.4	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	DALAPON	6	200	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	DIMETHOATE	1	-	ug/L

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Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	3/9/2009	METHIOCARB	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	PROPACHLOR	0.25	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	PROPOXUR	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	BENTAZON	0.4	18	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	2,4-DB	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	OXAMYL	20	50	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	PENTACHLOROPHENOL	0.2	1	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	ATRAZINE	0.1	1	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	2,4,5-TP (SILVEX)	0.5	50	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	METHOMYL	2	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	ALDICARB	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	SIMAZINE	0.5	4	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	PROMETRYN	0.15	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	METOLACHLOR	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	PICLORAM	0.2	500	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	2,4-D	1	70	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	2,4,5-T	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	CARBARYL	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	ALACHLOR	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	BUTACHLOR	0.38	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	DIQUAT	0.4	20	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	ACIFLURFEN	0.2	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	DINOSEB	1	7	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	CARBOFURAN	5	18	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	METRIBUZIN	0.25	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	DICAMBA	0.4	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	BROMACIL	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	MOLINATE	0.25	20	ug/L
BELL CANYON RESERVOIR INTAKE	3/9/2009	DICHLORPROP	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/11/2009	TOTAL ORGANIC CARBON (TOC)	3.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	1/14/2009	TOTAL ORGANIC CARBON (TOC)	4.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	12/17/2008	TOTAL ORGANIC CARBON (TOC)	4.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	11/12/2008	TOTAL ORGANIC CARBON (TOC)	4.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/8/2008	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	9/17/2008	PERCHLORATE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	9/17/2008	SPECIFIC CONDUCTANCE	78	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	9/10/2008	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	8/13/2008	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	2-CHLOROTOLUENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	4-CHLOROTOLUENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	N-BUTYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	P-ISOPROPYLTOLUENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	BROMOCHLOROMETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	M,P-XYLENE	0.5	1750	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	BROMODICHLORMETHANE (THM)	0.5	80	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	CARBON TETRACHLORIDE	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	BROMOFORM (THM)	0.5	80	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	DIBROMOCHLOROMETHANE (THM)	0.5	80	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	CHLOROFORM (THM)	0.5	80	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	TOLUENE	0.5	150	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	BENZENE	0.3	1	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	ACRYLONITRILE	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	MONOCHLOROBENZENE	0.5	70	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	CHLOROETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	ETHYLBENZENE	0.5	300	ug/L

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	8/7/2008	HEXACHLOROBUTADIENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	BROMOMETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	CHLOROMETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	DICHLOROMETHANE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	TETRACHLOROETHYLENE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	TRICHLOROFLUOROMETHANE	0.5	150	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,1-DICHLOROETHANE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,1-DICHLOROETHYLENE	0.3	6	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,1,1-TRICHLOROETHANE	0.5	200	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,1,2-TRICHLOROETHANE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,1,2,2-TETRACHLOROETHANE	0.5	1	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,2-DICHLOROETHANE	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,2-DICHLOROBENZENE	0.5	600	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,2-DICHLOROPROPANE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	TRANS-1,2-DICHLOROETHYLENE	0.5	10	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,2,4-TRICHLOROBENZENE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,3-DICHLOROPROPENE (TOTAL)	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,3-DICHLOROBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,4-DICHLOROBENZENE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	DICHLORODIFLUOROMETHANE (FREON 12)	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	NAPHTHALENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	TRANS-1,3-DICHLOROPROPENE	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	CIS-1,3-DICHLOROPROPENE	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	VINYL CHLORIDE	0.5	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	TRICHLOROETHYLENE	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	METHYL-TERT-BUTYL-ETHER (MTBE)	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	CARBON DISULFIDE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	CIS-1,2-DICHLOROETHYLENE	0.5	6	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	STYRENE	0.5	100	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	O-XYLENE	0.5	1750	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,1-DICHLOROPROPENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	2,2-DICHLOROPROPANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,3-DICHLOROPROPANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,2,4-TRIMETHYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	ISOPROPYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1-PHENYLPROPANE (N-PROPYLBENZENE)	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,3,5-TRIMETHYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	SEC-BUTYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	TERT-BUTYLBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,1,1,2-TETRACHLORETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	DIBROMOMETHANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,2,3-TRICHLOROBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	XYLENES (TOTAL)	0.5	1750	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	ACETONE	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	BROMOBENZENE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	METHYL ETHYL KETONE	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	METHYL ISOBUTYL KETONE	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.5	1200	ug/L
BELL CANYON RESERVOIR INTAKE	8/7/2008	TOTAL TRIHALOMETHANES	0.5	80	ug/L
BELL CANYON RESERVOIR INTAKE	7/9/2008	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/11/2008	TOTAL ORGANIC CARBON (TOC)	4.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/14/2008	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2008	TOTAL ORGANIC CARBON (TOC)	4.2	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	PERCHLORATE	0	6	ug/L

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	4/8/2008	SPECIFIC CONDUCTANCE	68	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/8/2008	DIBROMOCHLOROPROPANE (DBCP)	0	0.2	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	ETHYLENE DIBROMIDE (EDB)	0	0.05	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	COLOR	**37**	15	CU
BELL CANYON RESERVOIR INTAKE	4/8/2008	ODOR THRESHOLD @ 60 C	1	3	TON
BELL CANYON RESERVOIR INTAKE	4/8/2008	SPECIFIC CONDUCTANCE	66	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/8/2008	PH, LABORATORY	6.8	-	-
BELL CANYON RESERVOIR INTAKE	4/8/2008	ALKALINITY (TOTAL) AS CaCO3	23	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	BICARBONATE ALKALINITY	28	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	CARBONATE ALKALINITY	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	HARDNESS (TOTAL) AS CACO3	19	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	CALCIUM	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	MAGNESIUM	2	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	SODIUM	5.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	CHLORIDE	3.8	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	SULFATE	3.1	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	BARIUM	22	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	COPPER	20	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	IRON	**540**	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	MANGANESE	22	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	ALUMINUM	630	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	TOTAL DISSOLVED SOLIDS	97	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	NITRATE (AS NO3)	1	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	GLYPHOSATE	10	700	ug/L
BELL CANYON RESERVOIR INTAKE	4/8/2008	TURBIDITY, LABORATORY	**5.6**	5	NTU
BELL CANYON RESERVOIR INTAKE	4/8/2008	AGGRSSIVE INDEX (CORROSIVITY)	9.24	-	0
BELL CANYON RESERVOIR INTAKE	3/12/2008	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/13/2008	TOTAL ORGANIC CARBON (TOC)	4.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	1/9/2008	TOTAL ORGANIC CARBON (TOC)	5.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	12/12/2007	TOTAL ORGANIC CARBON (TOC)	4.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	11/14/2007	RADIUM 228 MDA95	0.5	-	PCI/L
BELL CANYON RESERVOIR INTAKE	11/14/2007	RADIUM 228	0	-	PCI/L
BELL CANYON RESERVOIR INTAKE	11/14/2007	RADIUM 228 COUNTING ERROR	0.54	-	PCI/L
BELL CANYON RESERVOIR INTAKE	11/14/2007	TOTAL ORGANIC CARBON (TOC)	4.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/10/2007	TOTAL ORGANIC CARBON (TOC)	4.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/10/2007	GROSS ALPHA MDA95	1.1	-	PCI/L
BELL CANYON RESERVOIR INTAKE	10/10/2007	GROSS ALPHA	0.219	15	PCI/L
BELL CANYON RESERVOIR INTAKE	10/10/2007	GROSS ALPHA COUNTING ERROR	0.615	-	PCI/L
BELL CANYON RESERVOIR INTAKE	9/12/2007	TOTAL ORGANIC CARBON (TOC)	3.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	8/9/2007	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/18/2007	GROSS ALPHA MDA95	1.1	-	PCI/L

Data from State Water Resources Control Board, Division of Drinking Water

Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	7/18/2007	RADIUM 228 MDA95	0.5	-	PCI/L
BELL CANYON RESERVOIR INTAKE	7/18/2007	GROSS ALPHA	0	15	PCI/L
BELL CANYON RESERVOIR INTAKE	7/18/2007	GROSS ALPHA COUNTING ERROR	0.458	-	PCI/L
BELL CANYON RESERVOIR INTAKE	7/18/2007	RADIUM 228	0.243	-	PCI/L
BELL CANYON RESERVOIR INTAKE	7/18/2007	RADIUM 228 COUNTING ERROR	0.588	-	PCI/L
BELL CANYON RESERVOIR INTAKE	7/11/2007	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/13/2007	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2007	TOTAL ORGANIC CARBON (TOC)	4.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	COLOR	15	15	CU
BELL CANYON RESERVOIR INTAKE	5/1/2007	ODOR THRESHOLD @ 60 C	2	3	TON
BELL CANYON RESERVOIR INTAKE	5/1/2007	SPECIFIC CONDUCTANCE	74	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	5/1/2007	PH, LABORATORY	6.8	-	-
BELL CANYON RESERVOIR INTAKE	5/1/2007	ALKALINITY (TOTAL) AS CaCO3	24	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	BICARBONATE ALKALINITY	29	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	NITRITE (AS N)	400	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	HARDNESS (TOTAL) AS CACO3	19	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	CALCIUM	4.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	MAGNESIUM	1.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	SODIUM	5.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	CHLORIDE	3.9	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	SULFATE	2.8	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	CHROMIUM (TOTAL)	1	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	IRON	220	300	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	MANGANESE	20	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	ALUMINUM	210	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	TOTAL DISSOLVED SOLIDS	92	1500	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	NITRATE (AS NO3)	2	45	mg/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/2007	TURBIDITY, LABORATORY	2.1	5	NTU
BELL CANYON RESERVOIR INTAKE	4/18/2007	GROSS ALPHA MDA95	1	-	PCI/L
BELL CANYON RESERVOIR INTAKE	4/18/2007	RADIUM 228 MDA95	0.5	-	PCI/L
BELL CANYON RESERVOIR INTAKE	4/18/2007	GROSS ALPHA	0.483	15	PCI/L
BELL CANYON RESERVOIR INTAKE	4/18/2007	GROSS ALPHA COUNTING ERROR	0.664	-	PCI/L
BELL CANYON RESERVOIR INTAKE	4/18/2007	RADIUM 228	0.226	-	PCI/L
BELL CANYON RESERVOIR INTAKE	4/18/2007	RADIUM 228 COUNTING ERROR	0.598	-	PCI/L
BELL CANYON RESERVOIR INTAKE	4/11/2007	TOTAL ORGANIC CARBON (TOC)	4.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	3/20/2007	GLYPHOSATE	0	700	ug/L
BELL CANYON RESERVOIR INTAKE	2/14/2007	TOTAL ORGANIC CARBON (TOC)	4.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	1/17/2007	GROSS ALPHA MDA95	1	-	PCI/L

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	1/17/2007	RADIUM 228 MDA95	0.47	-	PCI/L
BELL CANYON RESERVOIR INTAKE	1/17/2007	GROSS ALPHA	0.06	15	PCI/L
BELL CANYON RESERVOIR INTAKE	1/17/2007	GROSS ALPHA COUNTING ERROR	0.522	-	PCI/L
BELL CANYON RESERVOIR INTAKE	1/17/2007	RADIUM 228	0.175	-	PCI/L
BELL CANYON RESERVOIR INTAKE	1/17/2007	RADIUM 228 COUNTING ERROR	0.554	-	PCI/L
BELL CANYON RESERVOIR INTAKE	1/10/2007	TOTAL ORGANIC CARBON (TOC)	4.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	12/13/2006	TOTAL ORGANIC CARBON (TOC)	3.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	11/15/2006	TOTAL ORGANIC CARBON (TOC)	3.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/11/2006	TOTAL ORGANIC CARBON (TOC)	3.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	8/9/2006	TOTAL ORGANIC CARBON (TOC)	3.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/14/2006	TOTAL ORGANIC CARBON (TOC)	3.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	ASBESTOS	0	7	MFL
BELL CANYON RESERVOIR INTAKE	5/18/2006	COLOR	**30**	15	CU
BELL CANYON RESERVOIR INTAKE	5/18/2006	ODOR THRESHOLD @ 60 C	**3.3**	3	TON
BELL CANYON RESERVOIR INTAKE	5/18/2006	SPECIFIC CONDUCTANCE	63	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	5/18/2006	PH, LABORATORY	7.2	-	-
BELL CANYON RESERVOIR INTAKE	5/18/2006	ALKALINITY (TOTAL) AS CaCO3	25	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	BICARBONATE ALKALINITY	30	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	CARBONATE ALKALINITY	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	HARDNESS (TOTAL) AS CACO3	18	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	CALCIUM	4.2	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	MAGNESIUM	1.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	SODIUM	4.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	CHLORIDE	3.3	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	SULFATE	2.7	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	BARIUM	22	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	COPPER	36	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	IRON	**560**	300	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	MANGANESE	20	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	ALUMINUM	920	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	METHYL-TERT-BUTYL-ETHER (MTBE)	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	TOTAL DISSOLVED SOLIDS	81	1500	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/18/2006	TURBIDITY, LABORATORY	5	5	NTU
BELL CANYON RESERVOIR INTAKE	5/18/2006	AGGRSSIVE INDEX (CORROSIVITY)	9.66	-	0
BELL CANYON RESERVOIR INTAKE	5/10/2006	TOTAL ORGANIC CARBON (TOC)	3.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/12/2006	TOTAL ORGANIC CARBON (TOC)	3.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	3/8/2006	TOTAL ORGANIC CARBON (TOC)	4.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	THIOBENCARB	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	DIMETHOATE	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	PROPACHLOR	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	ENDOTHALL	0	100	ug/L

Data from State Water Resources Control Board, Division of Drinking Water

Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	2/2/2006	ATRAZINE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	SIMAZINE	0	4	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	PROMETRYN	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	METOLACHLOR	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	DIAZINON	0.025	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	ALACHLOR	0	2	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	BUTACHLOR	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	DIQUAT	0	20	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	GLYPHOSATE	0	700	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	METRIBUZIN	0.25	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	BROMACIL	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	MOLINATE	0	20	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	ALDICARB SULFOXIDE	4	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	ALDICARB SULFONE	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	3-HYDROXYCARBOFURAN	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	DCPA (TOTAL DI & MONO ACID DEGRADATES)	0.2	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	4-NITROPHENOL	0.4	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	DALAPON	6	200	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	METHIOCARB	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	PROPOXUR	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	BENTAZON	0.4	18	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	2,4-DB	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	OXAMYL	20	50	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	PENTACHLOROPHENOL	0.1	1	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	2,4,5-TP (SILVEX)	0.5	50	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	METHOMYL	2	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	ALDICARB	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	PICLORAM	0.2	500	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	2,4-D	1	70	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	2,4,5-T	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	METHYL-TERT-BUTYL-ETHER (MTBE)	0.5	5	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	NITRATE (AS NO3)	1.2	45	mg/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	CARBARYL	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	ACIFLURFEN	0.2	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	DINOSEB	1	7	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	CARBOFURAN	5	18	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	DICAMBA	0.4	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/2/2006	DICHLORPROP	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/11/2006	TOTAL ORGANIC CARBON (TOC)	4.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	12/14/2005	TOTAL ORGANIC CARBON (TOC)	4.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	11/9/2005	TOTAL ORGANIC CARBON (TOC)	3.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/26/2005	GLYPHOSATE	0	700	ug/L
BELL CANYON RESERVOIR INTAKE	10/12/2005	TOTAL ORGANIC CARBON (TOC)	3.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	9/14/2005	TOTAL ORGANIC CARBON (TOC)	4.2	-	mg/L
BELL CANYON RESERVOIR INTAKE	8/10/2005	TOTAL ORGANIC CARBON (TOC)	4.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/13/2005	TOTAL ORGANIC CARBON (TOC)	4.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/8/2005	TOTAL ORGANIC CARBON (TOC)	4.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	2-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	4-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	N-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	P-ISOPROPYLTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	BROMOCHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	ETHYL-TERT-BUTYL ETHER	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	TERT-AMYL-METHYL ETHER	0	-	ug/L

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	5/11/2005	BROMODICHLORMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	CARBON TETRACHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	BROMOFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	DIBROMOCHLOROMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	CHLOROFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	TOLUENE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	BENZENE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	MONOCHLOROBENZENE	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	CHLOROETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	ETHYLBENZENE	0	300	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	HEXACHLOROBUTADIENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	BROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	CHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	DICHLOROMETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	TETRACHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	TRICHLOROFLUOROMETHANE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,1-DICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,1-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,1,1-TRICHLOROETHANE	0	200	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,1,2-TRICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,1,2,2-TETRACHLOROETHANE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,2-DICHLOROETHANE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,2-DICHLOROBENZENE	0	600	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,2-DICHLOROPROPANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	TRANS-1,2-DICHLOROETHYLENE	0	10	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,2,4-TRICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,3-DICHLOROPROPENE (TOTAL)	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,3-DICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,4-DICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	2-CHLOROETHYLVINYL ETHER	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	DICHLORODIFLUOROMETHANE (FREON 12)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	VINYL CHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	TRICHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	METHYL-TERT-BUTYL-ETHER (MTBE)	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	TERT-BUTYL ALCOHOL	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	CIS-1,2-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	STYRENE	0	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	O-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,1-DICHLOROPROPENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	2,2-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,3-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,2,4-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	ISOPROPYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1-PHENYLPROPANE (N-PROPYLBENZENE)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,3,5-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	SEC-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	TERT-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,2,3-TRICHLOROPROPANE	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,1,1,2-TETRACHLORETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	DIBROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,2,3-TRICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	P-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	XYLENES (TOTAL)	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	BROMOBENZENE	0	-	ug/L

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	5/11/2005	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0	1200	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	M-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	TOTAL TRIHALOMETHANES	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/11/2005	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	COLOR	**20**	15	CU
BELL CANYON RESERVOIR INTAKE	4/20/2005	ODOR THRESHOLD @ 60 C	1	3	TON
BELL CANYON RESERVOIR INTAKE	4/20/2005	SPECIFIC CONDUCTANCE	71	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/20/2005	PH, LABORATORY	6.9	-	-
BELL CANYON RESERVOIR INTAKE	4/20/2005	ALKALINITY (TOTAL) AS CaCO3	24	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	BICARBONATE ALKALINITY	29	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	NITRITE (AS N)	400	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	HARDNESS (TOTAL) AS CACO3	26	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	CALCIUM	5.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	MAGNESIUM	2.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	SODIUM	4.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	CHLORIDE	4	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	SULFATE	3.9	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	FLUORIDE (F) (NATURAL-SOURCE)	0.26	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	CHROMIUM (TOTAL)	1	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	IRON	200	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	MANGANESE	20	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	ALUMINUM	460	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	TOTAL DISSOLVED SOLIDS	68	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	NITRATE (AS NO3)	5.5	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/20/2005	TURBIDITY, LABORATORY	3.7	5	NTU
BELL CANYON RESERVOIR INTAKE	4/20/2005	AGGRSSIVE INDEX (CORROSIVITY)	9.7	-	0
BELL CANYON RESERVOIR INTAKE	4/13/2005	TOTAL ORGANIC CARBON (TOC)	4.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	3/9/2005	TOTAL ORGANIC CARBON (TOC)	4.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	3/2/2005	CHROMIUM (TOTAL)	1	50	ug/L
BELL CANYON RESERVOIR INTAKE	3/2/2005	METHYL-TERT-BUTYL-ETHER (MTBE)	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	2/9/2005	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	1/12/2005	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	12/8/2004	TOTAL ORGANIC CARBON (TOC)	5.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	11/10/2004	TOTAL ORGANIC CARBON (TOC)	4.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/20/2004	NITRATE (AS NO3)	5.3	45	mg/L
BELL CANYON RESERVOIR INTAKE	10/13/2004	TOTAL ORGANIC CARBON (TOC)	4.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	8/12/2004	TOTAL ORGANIC CARBON (TOC)	4	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/14/2004	TOTAL ORGANIC CARBON (TOC)	3.7	-	mg/L

Data from State Water Resources Control Board, Division of Drinking Water

Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	6/9/2004	TOTAL ORGANIC CARBON (TOC)	3.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/2004	TOTAL ORGANIC CARBON (TOC)	3.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/14/2004	TOTAL ORGANIC CARBON (TOC)	4	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	CHROMIUM (TOTAL CR-CRVI SCREEN)	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	COLOR	**20**	15	CU
BELL CANYON RESERVOIR INTAKE	4/1/2004	ODOR THRESHOLD @ 60 C	1	3	TON
BELL CANYON RESERVOIR INTAKE	4/1/2004	SPECIFIC CONDUCTANCE	66	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/1/2004	PH, LABORATORY	7.1	-	-
BELL CANYON RESERVOIR INTAKE	4/1/2004	ALKALINITY (TOTAL) AS CaCO3	22	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	BICARBONATE ALKALINITY	27	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	NITRITE (AS N)	400	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	HARDNESS (TOTAL) AS CACO3	22	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	CALCIUM	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	MAGNESIUM	2.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	SODIUM	6.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	CHLORIDE	15	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	SULFATE	11	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	FLUORIDE (F) (NATURAL-SOURCE)	0.52	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	ARSENIC	4.6	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	IRON	210	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	MANGANESE	20	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	ALUMINUM	160	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	TOTAL DISSOLVED SOLIDS	75	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	NITRATE (AS NO3)	4.8	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/1/2004	TURBIDITY, LABORATORY	4	5	NTU
BELL CANYON RESERVOIR INTAKE	4/1/2004	AGGRSSIVE INDEX (CORROSIVITY)	9.5	-	0
BELL CANYON RESERVOIR INTAKE	4/1/2004	GLYPHOSATE	0	700	ug/L
BELL CANYON RESERVOIR INTAKE	3/10/2004	TOTAL ORGANIC CARBON (TOC)	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/11/2004	TOTAL ORGANIC CARBON (TOC)	4.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	1/14/2004	TOTAL ORGANIC CARBON (TOC)	4.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	CHLORIDE	4.8	600	mg/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	SULFATE	2.8	600	mg/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	HEXACHLOROCYCLOPENTADIENE	0	50	ug/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	LINDANE	0	0.2	ug/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	CHLORDANE	0	0.1	ug/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	ENDRIN	0	2	ug/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	TOXAPHENE	0	3	ug/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	HEPTACHLOR	0	0.01	ug/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	HEPTACHLOR EPOXIDE	0	0.01	ug/L

Bell Canyon Reservoir Intake
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Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	10/8/2003	METHOXYCHLOR	0	30	ug/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	HEXACHLOROBENZENE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	NITRATE (AS NO3)	6.1	45	mg/L
BELL CANYON RESERVOIR INTAKE	10/8/2003	ALACHLOR	0	2	ug/L
BELL CANYON RESERVOIR INTAKE	8/6/2003	GROSS ALPHA	0	15	PCI/L
BELL CANYON RESERVOIR INTAKE	8/6/2003	GROSS ALPHA COUNTING ERROR	0.693	-	PCI/L
BELL CANYON RESERVOIR INTAKE	4/30/2003	CHROMIUM (TOTAL CR-CRVI SCREEN)	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/30/2003	BORON	100	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/30/2003	VANADIUM	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	CHROMIUM (TOTAL CR-CRVI SCREEN)	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	COLOR	3	15	CU
BELL CANYON RESERVOIR INTAKE	4/9/2003	ODOR THRESHOLD @ 60 C	3	3	TON
BELL CANYON RESERVOIR INTAKE	4/9/2003	SPECIFIC CONDUCTANCE	79	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/9/2003	PH, LABORATORY	6.7	-	-
BELL CANYON RESERVOIR INTAKE	4/9/2003	ALKALINITY (TOTAL) AS CaCO3	22	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	BICARBONATE ALKALINITY	26	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	HARDNESS (TOTAL) AS CACO3	23	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	CALCIUM	5.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	MAGNESIUM	2.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	SODIUM	6.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	BORON	100	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	IRON	230	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	MANGANESE	36	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	VANADIUM	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	ALUMINUM	190	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	TOXAPHENE	0	3	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	TOTAL DISSOLVED SOLIDS	68	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	GLYPHOSATE	0	700	ug/L
BELL CANYON RESERVOIR INTAKE	4/9/2003	TURBIDITY, LABORATORY	2.5	5	NTU
BELL CANYON RESERVOIR INTAKE	4/9/2003	AGGRSSIVE INDEX (CORROSIVITY)	9.2	-	0
BELL CANYON RESERVOIR INTAKE	2/26/2003	TOTAL ORGANIC CARBON (TOC)	5.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	CHROMIUM (TOTAL CR-CRVI SCREEN)	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	BORON	100	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	CHROMIUM (TOTAL)	1	50	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	VANADIUM	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	DALAPON	0	200	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	BENTAZON	0	18	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	OXAMYL	0	50	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	ENDOTHALL	0	100	ug/L

Bell Canyon Reservoir Intake
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Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	1/29/2003	PENTACHLOROPHENOL	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	ATRAZINE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	2,4,5-TP (SILVEX)	0	50	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	SIMAZINE	0	4	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	PICLORAM	0	500	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	2,4-D	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	METHYL-TERT-BUTYL-ETHER (MTBE)	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	DIQUAT	0	20	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	DINOSEB	0	7	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	CARBOFURAN	0	18	ug/L
BELL CANYON RESERVOIR INTAKE	1/29/2003	DICAMBA	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/15/2003	TOTAL ORGANIC CARBON (TOC)	5.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	12/11/2002	TOTAL ORGANIC CARBON (TOC)	4.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	11/13/2002	TOTAL ORGANIC CARBON (TOC)	4.2	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/16/2002	CHROMIUM (TOTAL CR-CRVI SCREEN)	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/16/2002	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	10/16/2002	BORON	100	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/16/2002	VANADIUM	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/16/2002	NITRATE (AS NO3)	6.1	45	mg/L
BELL CANYON RESERVOIR INTAKE	9/11/2002	TOTAL ORGANIC CARBON (TOC)	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/17/2002	CHROMIUM (TOTAL CR-CRVI SCREEN)	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	7/17/2002	BORON	130	-	ug/L
BELL CANYON RESERVOIR INTAKE	7/17/2002	VANADIUM	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	7/10/2002	NITRATE (AS NO3)	2	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	CHROMIUM (TOTAL CR-CRVI SCREEN)	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	COLOR	**25**	15	CU
BELL CANYON RESERVOIR INTAKE	4/24/2002	ODOR THRESHOLD @ 60 C	1	3	TON
BELL CANYON RESERVOIR INTAKE	4/24/2002	SPECIFIC CONDUCTANCE	76	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/24/2002	PH, LABORATORY	6.8	-	-
BELL CANYON RESERVOIR INTAKE	4/24/2002	ALKALINITY (TOTAL) AS CaCO3	26	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	BICARBONATE ALKALINITY	32	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	NITRITE (AS N)	10	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	HARDNESS (TOTAL) AS CACO3	43	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	CALCIUM	8.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	MAGNESIUM	5.2	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	SODIUM	8.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	CHLORIDE	3.6	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	SULFATE	2.9	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	FLUORIDE (F) (NATURAL-SOURCE)	0.12	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	BORON	100	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	IRON	100	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	MANGANESE	30	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	VANADIUM	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	ANTIMONY	6	6	ug/L

Bell Canyon Reservoir Intake
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Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	4/24/2002	ALUMINUM	130	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	TOTAL DISSOLVED SOLIDS	86	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	NITRATE (AS NO3)	4	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/24/2002	TURBIDITY, LABORATORY	0.98	5	NTU
BELL CANYON RESERVOIR INTAKE	4/24/2002	AGGRSSIVE INDEX (CORROSIVITY)	9.5	-	0
BELL CANYON RESERVOIR INTAKE	4/17/2002	TOTAL ORGANIC CARBON (TOC)	4.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/10/2002	CHROMIUM (TOTAL CR-CRVI SCREEN)	1	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/10/2002	BORON	100	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/10/2002	VANADIUM	3	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/16/2002	METHYL-TERT-BUTYL-ETHER (MTBE)	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	COLOR	**35**	15	CU
BELL CANYON RESERVOIR INTAKE	5/9/2001	ODOR THRESHOLD @ 60 C	1	3	TON
BELL CANYON RESERVOIR INTAKE	5/9/2001	SPECIFIC CONDUCTANCE	76	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	5/9/2001	PH, LABORATORY	6.7	-	-
BELL CANYON RESERVOIR INTAKE	5/9/2001	ALKALINITY (TOTAL) AS CaCO3	24	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	BICARBONATE ALKALINITY	29	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	NITRITE (AS N)	10	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	HARDNESS (TOTAL) AS CACO3	19	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	CALCIUM	4.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	MAGNESIUM	1.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	SODIUM	7.2	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	CHLORIDE	3.9	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	SULFATE	2.8	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	FLUORIDE (F) (NATURAL-SOURCE)	0.13	2	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	CHROMIUM (TOTAL)	1	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	IRON	230	300	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	MANGANESE	30	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	ALUMINUM	140	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	TOTAL DISSOLVED SOLIDS	90	1500	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	NITRATE (AS NO3)	3.4	45	mg/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/9/2001	TURBIDITY, LABORATORY	**5.4**	5	NTU
BELL CANYON RESERVOIR INTAKE	5/9/2001	AGGRSSIVE INDEX (CORROSIVITY)	9.1	-	0
BELL CANYON RESERVOIR INTAKE	5/31/2000	METHYL-TERT-BUTYL-ETHER (MTBE)	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	COLOR	**40**	15	CU
BELL CANYON RESERVOIR INTAKE	2/15/2000	ODOR THRESHOLD @ 60 C	3	3	TON

Bell Canyon Reservoir Intake
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Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	2/15/2000	SPECIFIC CONDUCTANCE	71	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	2/15/2000	PH, LABORATORY	7	-	-
BELL CANYON RESERVOIR INTAKE	2/15/2000	ALKALINITY (TOTAL) AS CaCO3	22	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	BICARBONATE ALKALINITY	27	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	NITRITE (AS N)	10	1000	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	HARDNESS (TOTAL) AS CACO3	25	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	CALCIUM	6	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	MAGNESIUM	2	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	SODIUM	7	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	CHLORIDE	4	600	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	SULFATE	3	600	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	FLUORIDE (F) (NATURAL-SOURCE)	0	2	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	IRON	**320**	300	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	MANGANESE	30	50	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	ALUMINUM	370	1000	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	FOAMING AGENTS (MBAS)	0	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	METHYL-TERT-BUTYL-ETHER (MTBE)	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	TOTAL DISSOLVED SOLIDS	84	1500	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	NITRATE (AS NO3)	2	45	mg/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	CARBOFURAN	0	18	ug/L
BELL CANYON RESERVOIR INTAKE	2/15/2000	TURBIDITY, LABORATORY	4	5	NTU
BELL CANYON RESERVOIR INTAKE	2/15/2000	AGGRSSIVE INDEX (CORROSIVITY)	9	-	0
BELL CANYON RESERVOIR INTAKE	8/3/1999	GROSS ALPHA	0.08	15	PCI/L
BELL CANYON RESERVOIR INTAKE	8/3/1999	GROSS ALPHA COUNTING ERROR	0.24	-	PCI/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	COLOR	3	15	CU
BELL CANYON RESERVOIR INTAKE	6/10/1999	ODOR THRESHOLD @ 60 C	1.4	3	TON
BELL CANYON RESERVOIR INTAKE	6/10/1999	SPECIFIC CONDUCTANCE	110	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	6/10/1999	PH, LABORATORY	7.2	-	-
BELL CANYON RESERVOIR INTAKE	6/10/1999	ALKALINITY (TOTAL) AS CaCO3	24	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	BICARBONATE ALKALINITY	30	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	NITRITE (AS N)	10	1000	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	HARDNESS (TOTAL) AS CACO3	28	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	CALCIUM	6.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	MAGNESIUM	2.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	SODIUM	8.2	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	CHLORIDE	5.5	600	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	SULFATE	0.5	600	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	6/10/1999	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	IRON	100	300	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	MANGANESE	20	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	THALLIUM	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	ALUMINUM	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	TOTAL DISSOLVED SOLIDS	79	1500	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	NITRATE (AS NO3)	2	45	mg/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	6/10/1999	TURBIDITY, LABORATORY	2.1	5	NTU
BELL CANYON RESERVOIR INTAKE	6/10/1999	AGGRSSIVE INDEX (CORROSIVITY)	10	-	0
BELL CANYON RESERVOIR INTAKE	5/5/1999	2-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	4-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	N-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	P-ISOPROPYLTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	BROMOCHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	M,P-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	BROMODICHLORMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	CARBON TETRACHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	BROMOFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	DIBROMOCHLOROMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	CHLOROFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	TOLUENE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	BENZENE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	MONOCHLOROBENZENE	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	CHLOROETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	ETHYLBENZENE	0	300	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	HEXACHLOROBUTADIENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	BROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	CHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	DICHLOROMETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	TETRACHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	TRICHLOROFLUOROMETHANE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,1-DICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,1-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,1,1-TRICHLOROETHANE	0	200	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,1,2-TRICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,1,2,2-TETRACHLOROETHANE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,2-DICHLOROETHANE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,2-DICHLOROBENZENE	0	600	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,2-DICHLOROPROPANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	TRANS-1,2-DICHLOROETHYLENE	0	10	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,2,4-TRICHLOROBENZENE	0	5	ug/L

Bell Canyon Reservoir Intake
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Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,3-DICHLOROPROPENE (TOTAL)	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,3-DICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,4-DICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	DICHLORODIFLUOROMETHANE (FREON 12)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	NAPHTHALENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	VINYL CHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	TRICHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	METHYL-TERT-BUTYL-ETHER (MTBE)	3	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	CIS-1,2-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	STYRENE	0	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	O-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,1-DICHLOROPROPENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	2,2-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,3-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,2,4-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	ISOPROPYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1-PHENYLPROPANE (N-PROPYLBENZENE)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,3,5-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	SEC-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	TERT-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,2,3-TRICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,1,1,2-TETRACHLORETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	DIBROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,2,3-TRICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	P-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	XYLENES (TOTAL)	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	BROMOBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0	1200	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	M-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/5/1999	TOTAL TRIHALOMETHANES	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	3/31/1999	GROSS ALPHA	0.54	15	PCI/L
BELL CANYON RESERVOIR INTAKE	3/31/1999	GROSS ALPHA COUNTING ERROR	0.46	-	PCI/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	DALAPON	2.5	200	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	BENTAZON	2	18	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	OXAMYL	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	ENDOTHALL	45	100	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	PENTACHLOROPHENOL	0.1	1	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	ATRAZINE	0.1	1	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	2,4,5-TP (SILVEX)	0.5	50	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	SIMAZINE	0.07	4	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	PICLORAM	1	500	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	2,4-D	2.5	70	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	DIQUAT	0.4	20	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	DINOSEB	1	7	ug/L
BELL CANYON RESERVOIR INTAKE	2/4/1999	DICAMBA	0.5	-	ug/L
BELL CANYON RESERVOIR INTAKE	12/1/1998	GROSS ALPHA	0.89	15	PCI/L
BELL CANYON RESERVOIR INTAKE	12/1/1998	GROSS ALPHA COUNTING ERROR	0.29	-	PCI/L
BELL CANYON RESERVOIR INTAKE	8/21/1998	METHYL-TERT-BUTYL-ETHER (MTBE)	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	SPECIFIC CONDUCTANCE	190	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	6/9/1998	PH, LABORATORY	7.2	-	-
BELL CANYON RESERVOIR INTAKE	6/9/1998	ALKALINITY (TOTAL) AS CaCO3	22	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	BICARBONATE ALKALINITY	27	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	NITRITE (AS N)	453	1000	ug/L

Bell Canyon Reservoir Intake
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Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	6/9/1998	HARDNESS (TOTAL) AS CACO3	23	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	CALCIUM	4.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	MAGNESIUM	2.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	SODIUM	6.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	CHLORIDE	2.5	600	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	SULFATE	7.2	600	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	IRON	280	300	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	MANGANESE	30	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	THALLIUM	2	2	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	ALUMINUM	270	1000	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	TOTAL DISSOLVED SOLIDS	100	1500	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	NITRATE (AS NO3)	4.5	45	mg/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	AGGRSSIVE INDEX (CORROSIVITY)	9.6	-	0
BELL CANYON RESERVOIR INTAKE	6/9/1998	GROSS ALPHA	0.78	15	PCI/L
BELL CANYON RESERVOIR INTAKE	6/9/1998	GROSS ALPHA COUNTING ERROR	0.32	-	PCI/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	COLOR	**40**	15	CU
BELL CANYON RESERVOIR INTAKE	4/23/1997	ODOR THRESHOLD @ 60 C	1.4	3	TON
BELL CANYON RESERVOIR INTAKE	4/23/1997	SPECIFIC CONDUCTANCE	70	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/23/1997	PH, LABORATORY	7.1	-	-
BELL CANYON RESERVOIR INTAKE	4/23/1997	ALKALINITY (TOTAL) AS CaCO3	20	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	BICARBONATE ALKALINITY	24	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	NITRITE (AS N)	10	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	HARDNESS (TOTAL) AS CACO3	20	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	CALCIUM	5.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	MAGNESIUM	1.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	SODIUM	4.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	CHLORIDE	3	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	SULFATE	1	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	ARSENIC	2	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	IRON	100	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	MANGANESE	30	50	ug/L

Bell Canyon Reservoir Intake
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Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	4/23/1997	THALLIUM	2	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	ALUMINUM	560	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	TOTAL DISSOLVED SOLIDS	85	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	NITRATE (AS NO3)	4.5	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	TURBIDITY, LABORATORY	**7.8**	5	NTU
BELL CANYON RESERVOIR INTAKE	4/23/1997	AGGRSSIVE INDEX (CORROSIVITY)	9.5	-	0
BELL CANYON RESERVOIR INTAKE	4/23/1997	CARBOFURAN	0	18	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1997	ASBESTOS	0.2	7	MFL
BELL CANYON RESERVOIR INTAKE	1/3/1996	DALAPON	0	200	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	PENTACHLOROPHENOL	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	PICLORAM	0	500	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	CHLOROTHALONIL	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	NITRATE (AS NO3)	4.5	45	mg/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	DINOSEB	0	7	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	THIOBENCARB	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	DIMETHOATE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	PROPACHLOR	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	OXAMYL	0	50	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	ENDOTHALL	0	100	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	ATRAZINE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	SIMAZINE	0	4	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	PROMETRYN	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	METOLACHLOR	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	DIAZINON	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	DIURON	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	BUTACHLOR	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	DIQUAT	0	20	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	METRIBUZIN	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	BROMACIL	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	MOLINATE	0	20	ug/L
BELL CANYON RESERVOIR INTAKE	1/3/1996	ASBESTOS	0.2	7	MFL
BELL CANYON RESERVOIR INTAKE	5/25/1995	ATRAZINE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	SIMAZINE	0	4	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	ETHYLENE DIBROMIDE (EDB)	0	0.05	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	COLOR	**50**	15	CU
BELL CANYON RESERVOIR INTAKE	5/25/1995	ODOR THRESHOLD @ 60 C	3	3	TON
BELL CANYON RESERVOIR INTAKE	5/25/1995	SPECIFIC CONDUCTANCE	120	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	5/25/1995	PH, LABORATORY	7.1	-	-
BELL CANYON RESERVOIR INTAKE	5/25/1995	ALKALINITY (TOTAL) AS CaCO3	20	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	BICARBONATE ALKALINITY	24	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	NITRITE (AS N)	10	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	HARDNESS (TOTAL) AS CACO3	18	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	CALCIUM	4	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	MAGNESIUM	1.9	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	SODIUM	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	CHLORIDE	2.5	600	mg/L

Data from State Water Resources Control Board, Division of Drinking Water

Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	5/25/1995	SULFATE	6.8	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	ARSENIC	2.6	10	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	IRON	**450**	300	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	MANGANESE	**69**	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	THALLIUM	2	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	NICKEL	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	ANTIMONY	6	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	ALUMINUM	290	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	TOTAL DISSOLVED SOLIDS	83	1500	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	NITRATE (AS NO3)	4.5	45	mg/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	TURBIDITY, LABORATORY	**10**	5	NTU
BELL CANYON RESERVOIR INTAKE	5/25/1995	AGGRSSIVE INDEX (CORROSIVITY)	9.4	-	0
BELL CANYON RESERVOIR INTAKE	5/25/1995	GROSS ALPHA	1	15	PCI/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	GROSS ALPHA COUNTING ERROR	0.5	-	PCI/L
BELL CANYON RESERVOIR INTAKE	5/25/1995	GLYPHOSATE	0	700	ug/L
BELL CANYON RESERVOIR INTAKE	9/28/1994	NITRITE (AS N)	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	9/28/1994	NITRATE (AS NO3)	0.6	45	mg/L
BELL CANYON RESERVOIR INTAKE	9/28/1994	GROSS ALPHA	1.7	15	PCI/L
BELL CANYON RESERVOIR INTAKE	9/28/1994	GROSS ALPHA COUNTING ERROR	0.7	-	PCI/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	ALDICARB SULFOXIDE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	ALDICARB SULFONE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	3-HYDROXYCARBOFURAN	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	COLOR	**52**	15	CU
BELL CANYON RESERVOIR INTAKE	5/19/1994	ODOR THRESHOLD @ 60 C	**4**	3	TON
BELL CANYON RESERVOIR INTAKE	5/19/1994	SPECIFIC CONDUCTANCE	72	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	5/19/1994	PH, LABORATORY	6.6	-	-
BELL CANYON RESERVOIR INTAKE	5/19/1994	ALKALINITY (TOTAL) AS CaCO3	28	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	BICARBONATE ALKALINITY	17	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	HARDNESS (TOTAL) AS CACO3	24	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	CALCIUM	5.4	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	MAGNESIUM	2.5	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	SODIUM	7	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	POTASSIUM	2	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	CHLORIDE	3.9	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	SULFATE	2.3	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	BERYLLIUM	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	THALLIUM	**5**	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	NICKEL	20	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	ANTIMONY	1	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	ALUMINUM	50	1000	ug/L

Data from State Water Resources Control Board, Division of Drinking Water

Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	5/19/1994	BROMODICHLORMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	CARBON TETRACHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	BROMOFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	DIBROMOCHLOROMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	CHLOROFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	BENZENE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	MONOCHLOROBENZENE	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	ETHYLBENZENE	0	300	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	TETRACHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	TRICHLOROFLUOROMETHANE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	1,1-DICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	1,1-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	1,1,1-TRICHLOROETHANE	0	200	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	1,1,2-TRICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	1,1,2,2-TETRACHLOROETHANE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	1,2-DICHLOROETHANE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	1,2-DICHLOROPROPANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	TRANS-1,2-DICHLOROETHYLENE	0	10	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	1,3-DICHLOROPROPENE (TOTAL)	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	1,4-DICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	METHIOCARB	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	PROPOXUR	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	OXAMYL	0	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	METHOMYL	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	ALDICARB	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	VINYL CHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	TRICHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	TOTAL DISSOLVED SOLIDS	110	1500	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	NITRATE (AS NO3)	0.5	45	mg/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	CIS-1,2-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	CARBARYL	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	CARBOFURAN	0	18	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	XYLENES (TOTAL)	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0	1200	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	TURBIDITY, LABORATORY	2.21	5	NTU
BELL CANYON RESERVOIR INTAKE	5/19/1994	TOTAL TRIHALOMETHANES	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	GROSS ALPHA	0	15	PCI/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	GROSS ALPHA COUNTING ERROR	1.17	-	PCI/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	2,4,5-TP (SILVEX)	0	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	LINDANE	0	0.2	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	CHLORDANE	0	0.1	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	ENDRIN	0	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	TOXAPHENE	0	3	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	HEPTACHLOR	0	0.01	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	HEPTACHLOR EPOXIDE	0	0.01	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	METHOXYCHLOR	0	30	ug/L
BELL CANYON RESERVOIR INTAKE	5/19/1994	2,4-D	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	2-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	4-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	N-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	P-ISOPROPYLTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	BROMOCHLOROMETHANE	0	-	ug/L

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	3/15/1994	TOLUENE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	CHLOROETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	HEXACHLOROBUTADIENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	BROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	CHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	DICHLOROMETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1,2-DICHLOROBENZENE	0	600	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1,2,4-TRICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1,3-DICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	2-CHLOROETHYLVINYL ETHER	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	DICHLORODIFLUOROMETHANE (FREON 12)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	NAPHTHALENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	STYRENE	0	100	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1,1-DICHLOROPROPENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	2,2-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1,3-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1,2,4-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	ISOPROPYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1-PHENYLPROPANE (N-PROPYLBENZENE)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1,3,5-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	SEC-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	TERT-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1,2,3-TRICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1,1,1,2-TETRACHLORETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	DIBROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	1,2,3-TRICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	BROMOBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	GROSS ALPHA	1.02	15	PCI/L
BELL CANYON RESERVOIR INTAKE	3/15/1994	GROSS ALPHA COUNTING ERROR	1.16	-	PCI/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	COLOR	**40**	15	CU
BELL CANYON RESERVOIR INTAKE	5/12/1993	ODOR THRESHOLD @ 60 C	2	3	TON
BELL CANYON RESERVOIR INTAKE	5/12/1993	SPECIFIC CONDUCTANCE	60	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	5/12/1993	PH, LABORATORY	6.8	-	-
BELL CANYON RESERVOIR INTAKE	5/12/1993	ALKALINITY (TOTAL) AS CaCO3	20	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	BICARBONATE ALKALINITY	12	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	HARDNESS (TOTAL) AS CACO3	18	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	CALCIUM	4	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	MAGNESIUM	2	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	SODIUM	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	POTASSIUM	3	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	CHLORIDE	5	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	SULFATE	5	600	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	ARSENIC	5	10	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	BORON	100	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	IRON	**400**	300	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	MANGANESE	30	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	ZINC	50	5000	ug/L

Data from State Water Resources Control Board, Division of Drinking Water

Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	5/12/1993	ALUMINUM	190	1000	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	SELENIUM	2	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	TOTAL DISSOLVED SOLIDS	40	1500	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	NITRATE (AS NO3)	0.5	45	mg/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	MERCURY	0.2	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/12/1993	TURBIDITY, LABORATORY	3	5	NTU
BELL CANYON RESERVOIR INTAKE	3/30/1993	2-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	4-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	N-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	P-ISOPROPYLTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	BROMOCHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	M,P-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	ALDICARB SULFOXIDE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	ALDICARB SULFONE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	3-HYDROXYCARBOFURAN	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	BROMODICHLORMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	CARBON TETRACHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	BROMOFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	DIBROMOCHLOROMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	CHLOROFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	TOLUENE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	BENZENE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	MONOCHLOROBENZENE	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	CHLOROETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	ETHYLBENZENE	0	300	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	HEXACHLOROBUTADIENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	BROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	CHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	DICHLOROMETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	TETRACHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	TRICHLOROFLUOROMETHANE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,1-DICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,1-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,1,1-TRICHLOROETHANE	0	200	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,1,2-TRICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,1,2,2-TETRACHLOROETHANE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,2-DICHLOROETHANE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,2-DICHLOROBENZENE	0	600	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,2-DICHLOROPROPANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	TRANS-1,2-DICHLOROETHYLENE	0	10	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,2,4-TRICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,3-DICHLOROPROPENE (TOTAL)	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,3-DICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,4-DICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	2-CHLOROETHYLVINYL ETHER	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	DICHLORODIFLUOROMETHANE (FREON 12)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	NAPHTHALENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	DIBROMOCHLOROPROPANE (DBCP)	0	0.2	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	OXAMYL	0	50	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	METHOMYL	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	ALDICARB	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	VINYL CHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	TRICHLOROETHYLENE	0	5	ug/L

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	3/30/1993	CIS-1,2-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	STYRENE	0	100	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	O-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,1-DICHLOROPROPENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	2,2-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,3-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,2,4-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	ISOPROPYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1-PHENYLPROPANE (N-PROPYLBENZENE)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,3,5-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	SEC-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	TERT-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,2,3-TRICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,1,1,2-TETRACHLORETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	DIBROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,2,3-TRICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	CARBARYL	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	CARBOFURAN	0	18	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	XYLENES (TOTAL)	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	BROMOBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0	1200	ug/L
BELL CANYON RESERVOIR INTAKE	3/30/1993	TOTAL TRIHALOMETHANES	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	COLOR	**20**	15	CU
BELL CANYON RESERVOIR INTAKE	4/23/1992	ODOR THRESHOLD @ 60 C	1	3	TON
BELL CANYON RESERVOIR INTAKE	4/23/1992	SPECIFIC CONDUCTANCE	170	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/23/1992	PH, LABORATORY	6.5	-	-
BELL CANYON RESERVOIR INTAKE	4/23/1992	ALKALINITY (TOTAL) AS CaCO3	26	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	BICARBONATE ALKALINITY	32	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	HARDNESS (TOTAL) AS CACO3	19	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	CALCIUM	4.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	MAGNESIUM	1.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	SODIUM	5	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	CHLORIDE	3.7	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	SULFATE	7.1	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	ARSENIC	10	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	IRON	**730**	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	MANGANESE	**70**	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	ALUMINUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	TOTAL DISSOLVED SOLIDS	90	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	NITRATE (AS NO3)	1	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	TURBIDITY, LABORATORY	3.4	5	NTU

Data from State Water Resources Control Board, Division of Drinking Water

Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	4/23/1992	ATRAZINE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	SIMAZINE	0	4	ug/L
BELL CANYON RESERVOIR INTAKE	4/23/1992	GLYPHOSATE	0	700	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	COLOR	**50**	15	CU
BELL CANYON RESERVOIR INTAKE	4/3/1991	ODOR THRESHOLD @ 60 C	3	3	TON
BELL CANYON RESERVOIR INTAKE	4/3/1991	SPECIFIC CONDUCTANCE	69	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/3/1991	PH, LABORATORY	6.9	-	-
BELL CANYON RESERVOIR INTAKE	4/3/1991	ALKALINITY (TOTAL) AS CaCO3	20	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	BICARBONATE ALKALINITY	24	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	HARDNESS (TOTAL) AS CACO3	18	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	CALCIUM	4.2	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	MAGNESIUM	1.8	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	SODIUM	3.6	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	CHLORIDE	5.1	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	SULFATE	1	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	ARSENIC	10	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	IRON	**420**	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	MANGANESE	30	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	ALUMINUM	510	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	2,4,5-TP (SILVEX)	1	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	LINDANE	**0.4**	0.2	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	CHLORDANE	0.1	0.1	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	ENDRIN	0.02	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	TOXAPHENE	0.5	3	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	HEPTACHLOR	0.01	0.01	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	HEPTACHLOR EPOXIDE	0.01	0.01	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	METHOXYCHLOR	10	30	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	2,4-D	10	70	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	TOTAL DISSOLVED SOLIDS	85	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	NITRATE (AS NO3)	1.6	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/3/1991	TURBIDITY, LABORATORY	**8**	5	NTU
BELL CANYON RESERVOIR INTAKE	1/16/1991	GROSS ALPHA	1	15	PCI/L
BELL CANYON RESERVOIR INTAKE	1/16/1991	GROSS ALPHA COUNTING ERROR	2.01	-	PCI/L
BELL CANYON RESERVOIR INTAKE	10/24/1990	GROSS ALPHA	1.43	15	PCI/L
BELL CANYON RESERVOIR INTAKE	10/24/1990	GROSS ALPHA COUNTING ERROR	2.22	-	PCI/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	2-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	4-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	N-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	P-ISOPROPYLTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	BROMOCHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	M,P-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	BROMODICHLORMETHANE (THM)	0	80	ug/L

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Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	10/23/1990	CARBON TETRACHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	BROMOFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	DIBROMOCHLOROMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	CHLOROFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	TOLUENE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	BENZENE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	MONOCHLOROBENZENE	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	CHLOROETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	ETHYLBENZENE	0	300	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	HEXACHLOROBUTADIENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	BROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	CHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	DICHLOROMETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	TETRACHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	TRICHLOROFLUOROMETHANE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,1-DICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,1-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,1,1-TRICHLOROETHANE	0	200	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,1,2-TRICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,1,2,2-TETRACHLOROETHANE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,2-DICHLOROETHANE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,2-DICHLOROBENZENE	0	600	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,2-DICHLOROPROPANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	TRANS-1,2-DICHLOROETHYLENE	0	10	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,2,4-TRICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,3-DICHLOROPROPENE (TOTAL)	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,3-DICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,4-DICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	DICHLORODIFLUOROMETHANE (FREON 12)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	NAPHTHALENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	VINYL CHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	TRICHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	CIS-1,2-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	STYRENE	0	100	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	O-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,1-DICHLOROPROPENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	2,2-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,3-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,2,4-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	ISOPROPYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1-PHENYLPROPANE (N-PROPYLBENZENE)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,3,5-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	SEC-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	TERT-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,2,3-TRICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,1,1,2-TETRACHLORETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	DIBROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,2,3-TRICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	XYLENES (TOTAL)	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	BROMOBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0	1200	ug/L
BELL CANYON RESERVOIR INTAKE	10/23/1990	TOTAL TRIHALOMETHANES	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	COLOR	**30**	15	CU
BELL CANYON RESERVOIR INTAKE	6/7/1990	ODOR THRESHOLD @ 60 C	**8**	3	TON

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Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	6/7/1990	SPECIFIC CONDUCTANCE	100	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	6/7/1990	PH, LABORATORY	7.2	-	-
BELL CANYON RESERVOIR INTAKE	6/7/1990	ALKALINITY (TOTAL) AS CaCO3	32	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	BICARBONATE ALKALINITY	39	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	HARDNESS (TOTAL) AS CACO3	24	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	CALCIUM	6	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	MAGNESIUM	2.2	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	SODIUM	5.7	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	CHLORIDE	3.2	600	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	SULFATE	6.4	600	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	ARSENIC	10	10	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	IRON	**430**	300	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	MANGANESE	30	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	ALUMINUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	TOTAL DISSOLVED SOLIDS	99	1500	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	NITRATE (AS NO3)	1	45	mg/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	6/7/1990	TURBIDITY, LABORATORY	2	5	NTU
BELL CANYON RESERVOIR INTAKE	5/1/1990	2-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	4-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	N-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	P-ISOPROPYLTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	BROMOCHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	M,P-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	BROMODICHLORMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	CARBON TETRACHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	BROMOFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	DIBROMOCHLOROMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	CHLOROFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	TOLUENE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	BENZENE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	MONOCHLOROBENZENE	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	CHLOROETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	ETHYLBENZENE	0	300	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	HEXACHLOROBUTADIENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	BROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	CHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	DICHLOROMETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	TETRACHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	TRICHLOROFLUOROMETHANE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,1-DICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,1-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,1,1-TRICHLOROETHANE	0	200	ug/L

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,1,2-TRICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,1,2,2-TETRACHLOROETHANE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,2-DICHLOROETHANE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,2-DICHLOROBENZENE	0	600	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,2-DICHLOROPROPANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	TRANS-1,2-DICHLOROETHYLENE	0	10	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,2,4-TRICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,3-DICHLOROPROPENE (TOTAL)	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,3-DICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,4-DICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	DICHLORODIFLUOROMETHANE (FREON 12)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	NAPHTHALENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	2,4,5-TP (SILVEX)	1	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	VINYL CHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	TRICHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	LINDANE	**0.4**	0.2	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	CHLORDANE	0.1	0.1	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	ENDRIN	0.01	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	TOXAPHENE	0.5	3	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	HEPTACHLOR	0.01	0.01	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	HEPTACHLOR EPOXIDE	0.01	0.01	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	METHOXYCHLOR	10	30	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	2,4-D	10	70	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	CIS-1,2-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	STYRENE	0	100	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	O-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,1-DICHLOROPROPENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	2,2-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,3-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,2,4-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	ISOPROPYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1-PHENYLPROPANE (N-PROPYLBENZENE)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,3,5-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	SEC-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	TERT-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,2,3-TRICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,1,1,2-TETRACHLORETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	DIBROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,2,3-TRICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	XYLENES (TOTAL)	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	BROMOBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0	1200	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	TOTAL TRIHALOMETHANES	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	GROSS ALPHA	1	15	PCI/L
BELL CANYON RESERVOIR INTAKE	5/1/1990	GROSS ALPHA COUNTING ERROR	1.38	-	PCI/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	2-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	4-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	N-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	P-ISOPROPYLTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	BROMOCHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	M,P-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	BROMODICHLORMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	CARBON TETRACHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	BROMOFORM (THM)	0	80	ug/L

Data from State Water Resources Control Board, Division of Drinking Water *Data Obtained 10/29/2015*

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	1/25/1990	DIBROMOCHLOROMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	CHLOROFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	TOLUENE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	BENZENE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	MONOCHLOROBENZENE	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	CHLOROETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	ETHYLBENZENE	0	300	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	HEXACHLOROBUTADIENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	BROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	CHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	DICHLOROMETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	TETRACHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	TRICHLOROFLUOROMETHANE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,1-DICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,1-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,1,1-TRICHLOROETHANE	0	200	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,1,2-TRICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,1,2,2-TETRACHLOROETHANE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,2-DICHLOROETHANE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,2-DICHLOROBENZENE	0	600	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,2-DICHLOROPROPANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	TRANS-1,2-DICHLOROETHYLENE	0	10	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,2,4-TRICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,3-DICHLOROPROPENE (TOTAL)	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,3-DICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,4-DICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	DICHLORODIFLUOROMETHANE (FREON 12)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	NAPHTHALENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	VINYL CHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	TRICHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	CIS-1,2-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	STYRENE	0	100	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	O-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,1-DICHLOROPROPENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	2,2-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,3-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,2,4-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	ISOPROPYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1-PHENYLPROPANE (N-PROPYLBENZENE)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,3,5-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	SEC-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	TERT-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,2,3-TRICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,1,1,2-TETRACHLORETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	DIBROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,2,3-TRICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	XYLENES (TOTAL)	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	BROMOBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0	1200	ug/L
BELL CANYON RESERVOIR INTAKE	1/25/1990	TOTAL TRIHALOMETHANES	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	8/15/1989	DI(2-ETHYLHEXYL)PHTHALATE	0	4	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	COLOR	5	15	CU
BELL CANYON RESERVOIR INTAKE	7/24/1989	ODOR THRESHOLD @ 60 C	3	3	TON
BELL CANYON RESERVOIR INTAKE	7/24/1989	SPECIFIC CONDUCTANCE	120	2200	UMHOS/CM

Data from State Water Resources Control Board, Division of Drinking Water *Data Obtained 10/29/2015*

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	7/24/1989	PH, LABORATORY	7.3	-	-
BELL CANYON RESERVOIR INTAKE	7/24/1989	ALKALINITY (TOTAL) AS CaCO3	40	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	BICARBONATE ALKALINITY	49	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	HARDNESS (TOTAL) AS CACO3	21	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	CALCIUM	5.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	MAGNESIUM	2.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	SODIUM	12	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	CHLORIDE	8.1	600	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	SULFATE	16	600	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	ARSENIC	10	10	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	BARIUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	CADMIUM	1	5	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	CHROMIUM (TOTAL)	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	IRON	100	300	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	LEAD	5	-	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	MANGANESE	30	50	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	SILVER	10	100	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	ALUMINUM	100	1000	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	SELENIUM	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	FOAMING AGENTS (MBAS)	0.05	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	TOTAL DISSOLVED SOLIDS	95	1500	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	NITRATE (AS NO3)	0.89	45	mg/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	7/24/1989	TURBIDITY, LABORATORY	0.4	5	NTU
BELL CANYON RESERVOIR INTAKE	7/19/1989	CARBOFURAN	1	18	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	2,4,5-TP (SILVEX)	1	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	LINDANE	**0.4**	0.2	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	CHLORDANE	**1**	0.1	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	ENDRIN	0.01	2	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	TOXAPHENE	0.5	3	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	HEPTACHLOR	**0.3**	0.01	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	METHOXYCHLOR	10	30	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	2,4-D	10	70	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	2-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	4-CHLOROTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	N-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	P-ISOPROPYLTOLUENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	BROMOCHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	M,P-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	BROMODICHLORMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	CARBON TETRACHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	BROMOFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	DIBROMOCHLOROMETHANE (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	CHLOROFORM (THM)	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	TOLUENE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	BENZENE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	MONOCHLOROBENZENE	0	70	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	CHLOROETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	ETHYLBENZENE	0	300	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	HEXACHLOROBUTADIENE	0	-	ug/L

Data from State Water Resources Control Board, Division of Drinking Water

Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	6/22/1989	BROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	CHLOROMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	DICHLOROMETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	TETRACHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	TRICHLOROFLUOROMETHANE	0	150	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,1-DICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,1-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,1,1-TRICHLOROETHANE	0	200	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,1,2-TRICHLOROETHANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,1,2,2-TETRACHLOROETHANE	0	1	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,2-DICHLOROETHANE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,2-DICHLOROBENZENE	0	600	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,2-DICHLOROPROPANE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	TRANS-1,2-DICHLOROETHYLENE	0	10	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,2,4-TRICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,3-DICHLOROPROPENE (TOTAL)	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,3-DICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,4-DICHLOROBENZENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	DICHLORODIFLUOROMETHANE (FREON 12)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	NAPHTHALENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	ATRAZINE	1	1	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	2,4,5-TP (SILVEX)	1	50	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	SIMAZINE	1	4	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	VINYL CHLORIDE	0	0.5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	TRICHLOROETHYLENE	0	5	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	LINDANE	**0.4**	0.2	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	CHLORDANE	**1**	0.1	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	ENDRIN	0.01	2	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	TOXAPHENE	0.5	3	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	HEPTACHLOR	**0.3**	0.01	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	METHOXYCHLOR	10	30	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	2,4-D	10	70	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	CIS-1,2-DICHLOROETHYLENE	0	6	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	STYRENE	0	100	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	O-XYLENE	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,1-DICHLOROPROPENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	2,2-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,3-DICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,2,4-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	ISOPROPYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1-PHENYLPROPANE (N-PROPYLBENZENE)	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,3,5-TRIMETHYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	SEC-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	TERT-BUTYLBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,2,3-TRICHLOROPROPANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,1,1,2-TETRACHLORETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	DIBROMOMETHANE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,2,3-TRICHLOROBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	GLYPHOSATE	5	700	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	XYLENES (TOTAL)	0	1750	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	BROMOBENZENE	0	-	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0	1200	ug/L
BELL CANYON RESERVOIR INTAKE	6/22/1989	TOTAL TRIHALOMETHANES	0	80	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	COLOR	5	15	CU

Data from State Water Resources Control Board, Division of Drinking Water

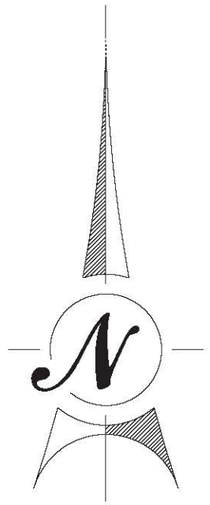
Data Obtained 10/29/2015

Bell Canyon Reservoir Intake
Sample Data 1989 - 2012

Source Name	Sample Date	Constituent	Finding	MCL	Units
BELL CANYON RESERVOIR INTAKE	4/15/1987	ODOR THRESHOLD @ 60 C	**17**	3	TON
BELL CANYON RESERVOIR INTAKE	4/15/1987	SPECIFIC CONDUCTANCE	110	2200	UMHOS/CM
BELL CANYON RESERVOIR INTAKE	4/15/1987	PH, LABORATORY	6.7	-	-
BELL CANYON RESERVOIR INTAKE	4/15/1987	ALKALINITY (TOTAL) AS CaCO3	25	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	BICARBONATE ALKALINITY	30	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	CARBONATE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	HARDNESS (TOTAL) AS CACO3	22	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	CALCIUM	5.1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	MAGNESIUM	2.3	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	SODIUM	11	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	CHLORIDE	7.3	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	SULFATE	12	600	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	FLUORIDE (F) (NATURAL-SOURCE)	0.1	2	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	ARSENIC	10	10	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	BARIUM	500	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	CADMIUM	**10**	5	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	CHROMIUM (TOTAL)	5	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	COPPER	50	1000	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	IRON	100	300	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	LEAD	50	-	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	MANGANESE	50	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	SILVER	20	100	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	ZINC	50	5000	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	SELENIUM	10	50	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	FOAMING AGENTS (MBAS)	0.1	0.5	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	TOTAL DISSOLVED SOLIDS	94	1500	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	LANGELIER INDEX AT SOURCE TEMP.	2.2	-	-
BELL CANYON RESERVOIR INTAKE	4/15/1987	HYDROXIDE ALKALINITY	1	-	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	NITRATE (AS NO3)	0.4	45	mg/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	MERCURY	1	2	ug/L
BELL CANYON RESERVOIR INTAKE	4/15/1987	TURBIDITY, LABORATORY	0.3	5	NTU
BELL CANYON RESERVOIR INTAKE	5/22/1985	GROSS ALPHA	3	15	PCI/L
BELL CANYON RESERVOIR INTAKE	5/22/1985	GROSS ALPHA COUNTING ERROR	0.89	-	PCI/L
BELL CANYON RESERVOIR INTAKE	5/22/1985	2,4,5-TP (SILVEX)	0.1	50	ug/L
BELL CANYON RESERVOIR INTAKE	5/22/1985	LINDANE	0.1	0.2	ug/L
BELL CANYON RESERVOIR INTAKE	5/22/1985	ENDRIN	0.1	2	ug/L
BELL CANYON RESERVOIR INTAKE	5/22/1985	TOXAPHENE	0.1	3	ug/L
BELL CANYON RESERVOIR INTAKE	5/22/1985	METHOXYCHLOR	0.1	30	ug/L
BELL CANYON RESERVOIR INTAKE	5/22/1985	2,4-D	0.1	70	ug/L
BELL CANYON RESERVOIR INTAKE	6/27/1984	HARDNESS (TOTAL) AS CACO3	3	-	mg/L
BELL CANYON RESERVOIR INTAKE	6/27/1984	CALCIUM	0.99	-	mg/L
BELL CANYON RESERVOIR INTAKE	3/28/1984	HARDNESS (TOTAL) AS CACO3	3	-	mg/L
BELL CANYON RESERVOIR INTAKE	3/28/1984	CALCIUM	1.16	-	mg/L

APPENDIX Q

60/40 ANALYSIS



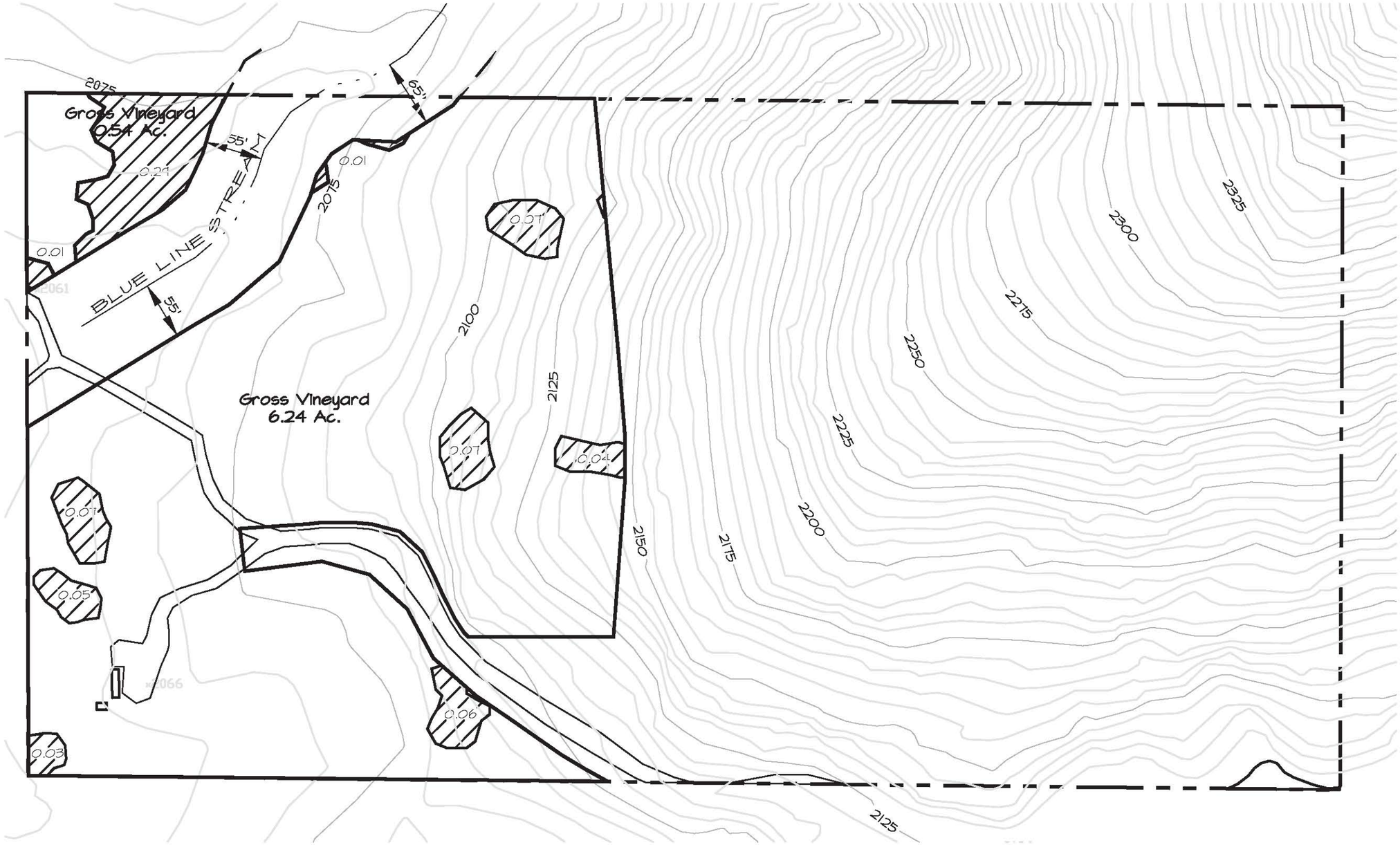
SCALE: 1"=100'
CONTOUR INTERVAL: 5'

0 50' 100' 200'

1993 Baseline Photo

	Allowable Removal	
	%	Ac.
1993 Tree Canopy (2.3 ac.)	40	0.92
1993 Developed Area (0.42 ac.)		
1993 Brush/Grass (16.03 ac.)	60	9.62
Total 18.75		10.54

DAVIS FRIESEN
APN: 018-060-012
Canopy Retention Analysis
NVVE, June 26, 2013

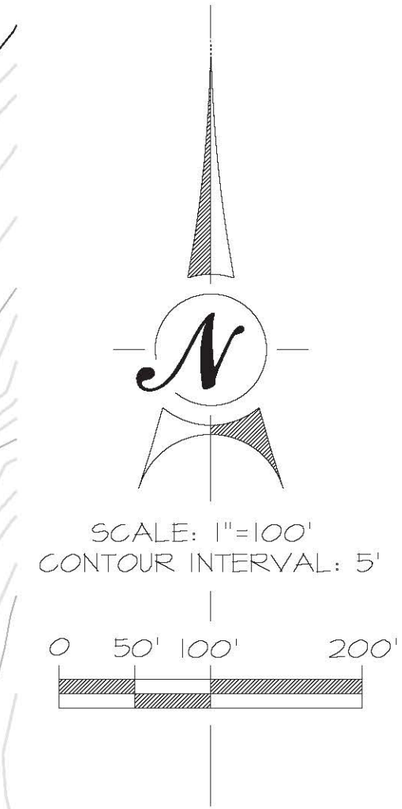


Allowable Removal		Proposed Removal
%	Ac.	Ac.
40	0.92	.70
60	9.62	5.66
	10.54	6.78

Proposed Tree Canopy Removal
1993 Developed Area (0.42 ac.)
1993 Brush/Grass, Slope
Proposed Gross Vineyard Boundary

DAVIS FRIESEN
APN: 018-060-012
1993 Canopy Retention Analysis
with Setbacks, Vineyards
NVVE, June 26, 2013

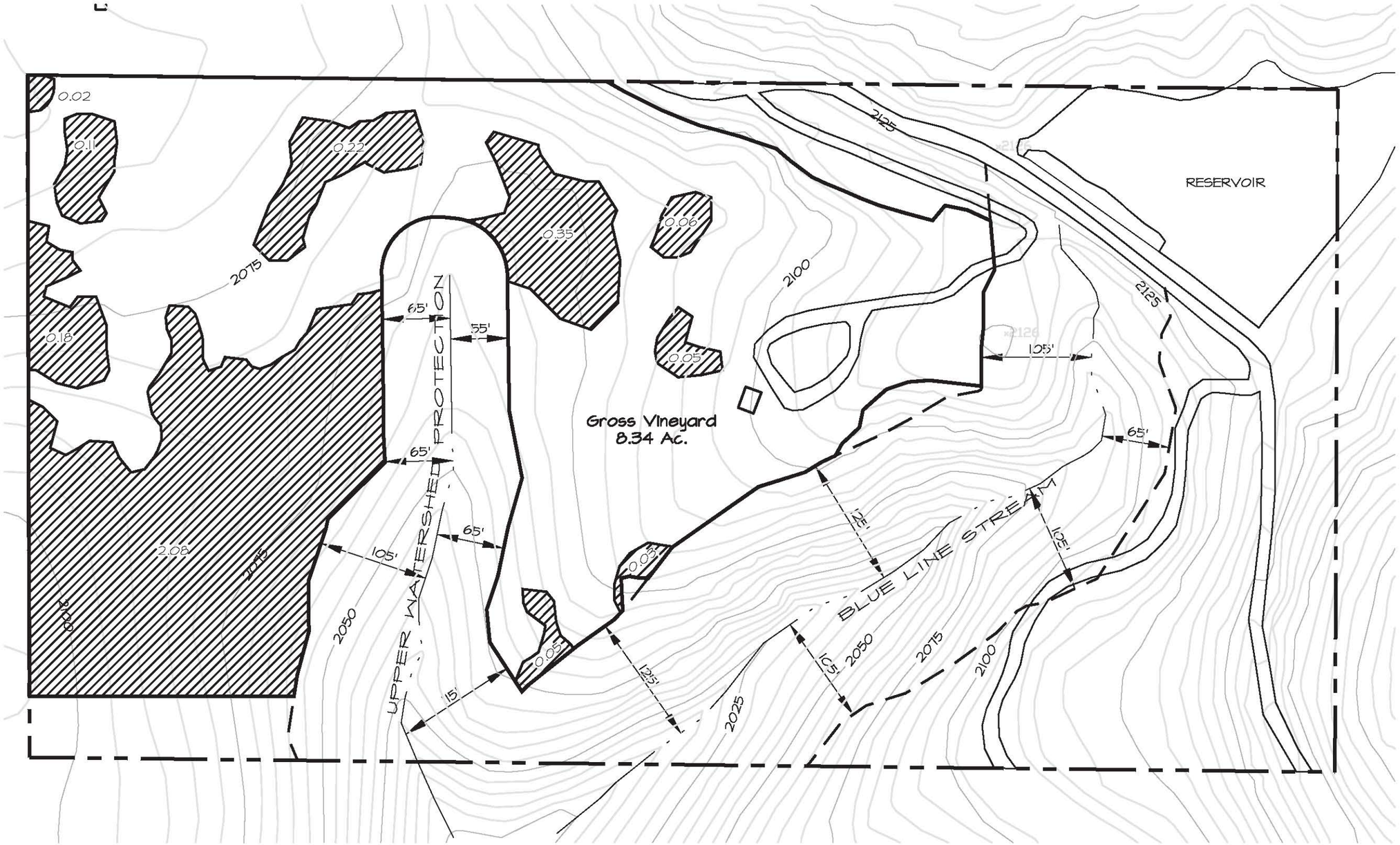
Sheet 2-12

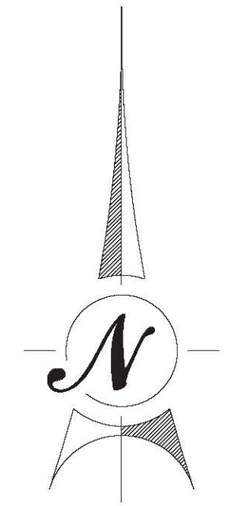


1993 Baseline Photo

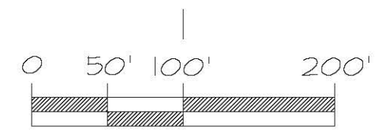
	Allowable Removal	
	%	Ac.
1993 Tree Canopy (7.87 ac.)	40	3.15
1993 Developed Area (1.62 ac.)		
1993 Brush/Grass (9.21 ac.)	60	5.53
Total 18.70		8.68

DAVIS FRIESEN
APN: 018-060-013
Canopy Retention Analysis
NVVE, June 26, 2013





SCALE: 1"=100'
CONTOUR INTERVAL: 5'



Proposed Tree Canopy Removal
1993 Developed Area (1.62 ac.)
1993 Brush/Grass, Slope
Proposed Gross Vineyard Boundary

Allowable Removal		Proposed Removal
%	Ac.	Ac.
40	3.15	3.15
60	5.53	5.19
	8.68	8.34

DAVIS FRIESEN
APN: 018-060-013
Canopy Retention Analysis
with Setbacks, Vineyards
NVVE, June 26, 2013

Sheet 2-13