Revised

Draft Environmental Impact Report

Russian River Frost Protection Regulation

~~May 2011~~September 2011

State Clearinghouse # 2010102053

Division of Water Rights
State Water Resources Control Board
California Environmental Protection Agency

Revised Draft Environmental Impact Report

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The State Water Resources Control Board (State Water Board or board) proposes to adopt a regulation (proposed regulation) that would require the implementation of programs designed to prevent salmonid stranding mortality due to water diversion for purposes of frost protection of crops in the Russian River watershed in Mendocino and Sonoma Counties. This document provides information regarding the potential environmental effects of adopting and, to the extent that the effects are reasonably foreseeable, implementing the proposed regulation.

Stranding can occur when salmonids are not able to escape from receding waters, typically when stream flows decrease and water levels recede rapidly. Diversion of water for frost protection of crops can cause a high instantaneous demand for water, which could lead to stranding. The proposed regulation would require individuals or governing bodies to manage diversions of water for frost protection to reduce the instantaneous demand on the stream system.

The proposed regulation would provide that, with the exception of diversions upstream of Warm Springs Dam in Sonoma County or Coyote Dam in Mendocino County, any diversion of water from the Russian River stream system, including the pumping of hydraulically connected groundwater, for purposes of frost protection from March 15 through May 15, shall be diverted in accordance with a board-approved water demand management program. The diversion of water in violation of the proposed regulation would be an unreasonable method of diversion and use and a violation of Water Code section 100. ~~water diversions from the Russian River stream system, including hydraulically connected groundwater, for purposes of frost protection from March 15 through May 15 are a violation of the prohibition against the unreasonable diversion or use of water, unless water is diverted in accordance with a Board approved water demand management program (WDMP), or the water is diverted upstream of Warm Springs Dam in Sonoma County or Coyote Dam in Mendocino County. In order to be approved~~The regulation would require, ~~would need~~ a WDMP to include the following elements: (1) an inventory of the frost diversion systems within the area subject to the WDMP, (2) a stream stage monitoring program, (3) an assessment of the potential risk of stranding mortality due to frost diversions, (4) the identification and implementation of corrective actions necessary to prevent stranding mortality, and (5) annual reporting of program data, activities, and results.

The proposed regulation would affect water diversions for frost protection use in the majority of the Russian River watershed, which encompasses portions of Mendocino and Sonoma counties. The anadromous salmonids in this geographic area include distinct populations of coho salmon, Chinook salmon, and steelhead.

Consideration of Alternatives

The State Water Board's objective for the project is to establish a regulation that will prevent salmonid stranding mortality while minimizing the impacts of the regulation on the use of water for purposes of frost protection. In support of this objective, the State Water Board's goals are to (a) promote local development and governance of programs that prevent stranding mortality during the frost season, (b) provide transparency of diversion and stream stage monitoring data, (c) ensure that the State Water Board can require any changes to WDMP's that are necessary to ensure that WDMP's are successful and implemented on a timely basis, (d) provide for State Water Board enforcement against non-compliance, and (e) develop a comprehensive regulation that includes all diverters of water for frost protection use, including diverters who pump groundwater that is hydraulically connected to the stream system.

This report considers the environmental impacts of the proposed regulation and other alternatives, including voluntary stakeholder efforts, local ordinances, and reliance on current State Water Board authority. It also evaluates whether the proposed Regulation and other alternatives meet the State Water Board's objective and goals for the project.

Programmatic Impact Assessment

The assessment of environmental effects was conducted at a programmatic level, which is more general than a project-specific analysis. The assessment was also conservative, in that if any reasonably foreseeable outcome of implementing the regulation for any one water diversion project could conceivably have a significant indirect effect on an environmental resource, then the effect was judged to be significant in all cases.

Potential effects on environmental resource areas were considered in terms of the possible responses of affected persons. The assessment was also conducted by defining categories of actions that people might take in response to implementation of the regulation that could have indirect environmental impacts. For instance, instead of pursuing a water right application to increase offstream storage, people may choose to install orchard heaters to warm the air surrounding crops to reduce the demand for water during the frost season. How people will respond to the implementation of the regulation, and where and when these actions may occur, cannot be predicted with certainty; however, for purposes of this assessment, this report identifies the following actions that may be taken by individuals in response to the proposed regulation:

- installing groundwater extraction wells and increasing groundwater use;
- constructing new and expanding existing offstream storage facilities and increased diversion of water to storage;
- modifying or removing surface water diversion structures;

- installing and operating wind machines;
- installing orchard heaters;
- installing stream stage gages;
- installing and operating diversion monitoring devices; and
- installing and operating low flow emitters.

These potential actions that individuals or governing bodies make take are analyzed in this report for their potential effects to the environment.

Environmental Effects of the Proposed Regulation

The adoption of the proposed regulation is anticipated to result in direct impacts from the installation of stream gages; however those impacts, unless USGS stream gages are selected, are anticipated to be less than significant.

Potentially significant direct and indirect impacts were identified in nearly all environmental resource areas. This analytical outcome is consistent with a programmatic, conservative analysis. Potentially significant direct and indirect impacts were identified in the areas of aesthetics, agriculture resources, air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use planning, mineral resources, noise, recreation, transportation and traffic, and utilities and service systems.

Future environmental reviews of individual projects developed in response to the proposed regulation can be expected to identify project-specific environmental effects. The lead agency for these projects must identify any project-specific environmental effects if the projects are subject to CEQA and either mitigate them to less-than-significant levels or adopt a statement of overriding considerations for approving the project despite the potential for significant environmental impacts. Mitigation measures for individual projects will be applied on a project-level basis and shall be tailored in consultation with the appropriate regulatory agency. Projects undertaken in response to the proposed regulation that involve individual water right applications or petitions will be evaluated under CEQA at a project-specific level by the State Water Board or, depending on the proposed project, by another lead agency. Projects that are subject to ministerial permits or otherwise exempt from CEQA may be required to implement any applicable requirements but would not be subject to project-specific analysis and mitigation under CEQA.

Analysis of Alternatives

The proposed regulation and identified alternatives were compared for their potential future environmental impacts and their anticipated success in achieving the objective and goals of the proposed project.

Generally speaking, alternatives to the proposed regulation that are less restrictive on diversions of water for frost protection use are anticipated to have a lower chance

of causing significant changes to environmental resources than alternatives that are more restrictive. At the same time, alternatives that are less restrictive on diversions of water for frost protection use are less likely to meet the project objective of preventing salmonid stranding mortality due to frost diversions.

From a CEQA standpoint, the environmentally superior alternative is the no-project alternative. Among the remaining alternatives, the environmentally superior alternative is the local stakeholder voluntary programs. Neither of these two alternatives however, fully meets the basic project objective of preventing salmonid stranding mortality. The proposed regulation and the alternative that requires real-time diversion monitoring and reporting both meet the project objective of preventing salmonid stranding mortality, but both are anticipated to result in more incidental environmental impacts due to water diverters implementing best management practices in response to the regulation.

1 INTRODUCTION

1.1 Purpose of This Document

The State Water Resources Control Board (State Water Board) proposes to adopt a Russian River Frost Regulation that would be designed to prevent salmonid stranding mortality due to water diversion for purposes of frost protection of crops in the Russian River Watershed in Mendocino and Sonoma counties (proposed regulation). This environmental impact report (EIR) provides information regarding the potential significant environmental effects of implementing the proposed Regulation, to the extent those effects are reasonably foreseeable.

1.2 Basis for the Proposed Regulation

In a letter dated February 19, 2009, the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) requested that the State Water Board take immediate action, such as implementing emergency regulations, to address concerns that water diversions from the Russian River stream system will cause significant salmonid mortality. The letter documents two episodes of fish stranding mortality that occurred in April 2008, one on Felta Creek in Sonoma County and the second on the mainstem of the Russian River near Hopland in Mendocino County.

The State Water Board has a duty to protect, where feasible, the state's public trust resources, including fisheries. In addition, the Board has the authority under article X, section 2 of the California Constitution and Water Code section 100 to prevent the waste or unreasonable use, unreasonable method of use, or the unreasonable method of diversion of all waters of the state.

In response to NOAA Fisheries' February 19, 2009 letter, the State Water Board held several workshops in 2009, 2010, and 2011 to receive information regarding (1) the need for and the effect of water diversions for purposes of frost protection of crops, (2) local voluntary efforts at managing water diversions for frost protection, and (3) the need for short- or long-term regulatory action by the State Water Board.

The National Marine Fisheries Service provided information supporting a position that the use of water for protection of grape vines from frost poses a documented threat to federally threatened and endangered salmonids in the Russian River watershed. Review of local voluntary efforts shows that the scope of the frost protection threat is beyond the ability of local organizations to manage on a strictly voluntary basis. The voluntary programs submitted for review did not have adequate plans for conservation in tributary streams, including monitoring programs. Conservation and monitoring in tributaries is important since these are locations where the impacts of water diversion for frost protection are likely most acute, and

where the majority of the salmonid habitat is located. In addition the voluntary programs do not possess the authority or willingness to ensure full compliance with proposed activities. Without sufficient participation in voluntary programs, effective management of all the water used for frost protection is not possible to ensure that no stranding mortality incidents occur in the future. Conservation efforts that would involve coordination of all water diversions on a watershed basis may be the most effective approach to prevent future stranding mortality incidents, but this type of process is beyond the scope of local voluntary efforts.

Upon consideration of this information, the State Water Board is proceeding to develop a proposed regulation that would require individuals or governing bodies to implement mandatory participation programs designed to prevent salmonid stranding mortality.

1.3 CEQA Analysis

1.3.1 Basic Purposes of CEQA

When proposing to undertake or approve a discretionary project, state agencies must comply with the procedural and substantive requirements of the California Environmental Quality Act (CEQA).[1] CEQA and the State CEQA Guidelines[2] establish procedures to be followed by state and local public agencies in analyzing and disclosing the environmental consequences of activities that an agency proposes to carry out or approve. CEQA applies to discretionary projects that may cause a direct or indirect physical change in the environment. As described in the CEQA Guidelines (§ 15002, subd. (a)), the basic purposes of CEQA are to:

> (1) Inform governmental decision makers and the public about the potential, significant environmental effects of proposed activities.
>
> (2) Identify ways that environmental damage can be avoided or significantly reduced.
>
> (3) Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.
>
> (4) Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.

[1] California Public Resources Code, section 21000 et seq.

[2] California Code of regulations, title 14, section 15000 et seq. (Unless otherwise noted, further references to the CEQA Guidelines refer to title 14 of the California Code of regulations.)

1.3.2 Application of CEQA to this Project

For purposes of this CEQA analysis, the proposed project is the adoption of the proposed regulation. The purpose of the proposed regulation is to prevent stranding mortality due to the cumulative effect of instantaneous diversions for purposes of frost protection of crops. The frost diversions themselves are not part of the project, however, and therefore this EIR does not analyze the effects of the diversions on the environment, including fishery resources. Instead, the purpose of this EIR is to analyze the incidental environmental effects of adopting the proposed regulation. As explained below, the nature and extent of those effects will depend in large part on the actions that diverters take in order to comply with the regulation.

1.3.3 Notice of Preparation and Scoping Meeting

On October 27, 2010, the State Water Board issued a Notice of Preparation of an Environmental Impact Report (NOP) and Notice of Scoping Meeting. The notice was sent to the State Clearinghouse, Governor's Office of Planning and Research and circulated to members of the public, government agencies, and other interested persons in order to solicit comments on the proposed regulation, and on the scope and content of the environmental information to be analyzed in this EIR. A copy of the Notice is included in this draft EIR as appendix A.

The NOP anticipated that the following environmental issue areas may be evaluated in the EIR: Aesthetics, Agricultural Resources, Air Quality, Biological Resources, Cultural Resources, Geology and Soils, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Noise, and Utilities and Service Systems.

The NOP also stated that adoption and implementation of the regulation could lead diverters of water for frost protection use to take actions that could result in indirect environmental impacts, including, but not limited to: modifying or constructing new off-stream storage reservoirs to store water diverted prior to the frost season for later use for frost protection; switching to a different method or combination of methods of frost protection such as installing wind machines, heaters, or non-interconnected groundwater wells, or employing helicopters. Affected persons could also make other changes to management practices, such as management of cover crops, use of barriers, use of alternative sources of water from water purveyors, or replacement of frost sensitive crops with more frost tolerant crops. Finally, growers could choose to discontinue frost protection all together.

The scoping meeting was held on November 17, 2010, in Santa Rosa, California. Fifty-eight individuals attended. The purpose of the meeting was to explain the proposed regulation and provide related information to resource agency personnel and the interested public and to invite them to submit written comments concerning the range of actions, regulation alternatives, mitigation measures, and significant effects that should be analyzed in the EIR.

The scoping period ended on November 30, 2010. Sixteen written comment letters were received. Comments were received from six state and local agencies, six non-governmental organizations and special-interest groups, and four individuals.

Commenters identified the following potential project alternatives and range of actions:

- No regulation/no action
- Require compliance with adopted local ordinances for frost protection
- Allow voluntary participation in local programs

Commenters identified the following potential environmental impacts:

- Installation or removal of devices in response to potential project alternatives may cause environmental impacts to air quality, biological resources, cultural resources, aesthetics, geology, soils, hydrology, and water quality; and may generate noise, hazardous materials, or sedimentation.

- Modification of operations or operation of new equipment in response to potential project alternatives may cause environmental impacts to air quality, biological resources, cultural resources, land use, agricultural resources, aesthetics, vegetation, wildlife, and wetlands; and may generate noise or hazardous materials.

Commenters identified the following potential mitigation measures:

- Parties who take action in response to the proposed regulation that involve land disturbance should assess whether the action will have an adverse impact on surface or subsurface historical resources within the area of project effect and if so to mitigate that effect. To adequately assess and mitigate project-related impacts to archaeological resources, the project proponents should work with the Native American Heritage Commission and appropriate Native American contacts to develop appropriate mitigation measures.

- Parties who take action in response to the proposed regulation that involve installation of stream gauges may need to comply with Fish and Game Code section 1600.

- Actions taken in response to the proposed regulation involving discharges to the waters of the state shall be in compliance with the Basin Plan of the North Coast Regional Water Quality Control Board.

This input was considered in the development of the project alternatives, environmental impacts, and mitigation measures analyzed in this document.

2 STATE WATER BOARD REGULATORY FRAMEWORK

The State Water Board exercises adjudicatory and regulatory water quality and water right functions in California.[3] All water in California belongs to the people of the State.[4] Although water cannot be privately owned, the right to use water can be acquired pursuant to statutory and common law.

2.1 Overview of Surface Water Rights and Administration

In general, surface water may be diverted under one of two basic types of water rights: riparian or appropriative. Under the riparian doctrine, the owner of land contiguous to a watercourse has the right to the reasonable, beneficial use of the natural flow of water on his or her land. A riparian user may not seasonally store water or use water outside the watershed.

An appropriative water right consists of the right to divert a specified quantity of water for a reasonable, beneficial use. Since December 19, 1914, the effective date of the Water Commission Act of 1913, the acquisition of an appropriative right has required a permit, license, or - in the case of a small domestic or stockpond right - a registration from the State Water Board.[5] Riparian rights and appropriative rights initiated before 1914 are excluded from the permit and license system,[6] but those water users generally must file statements of water diversion and use with the State Water Board.[7] An appropriative right carries a priority relative to other appropriative rights. The water user who is first in time, or "senior," is entitled to the full quantity of water specified under the right before junior appropriators may exercise their rights.

To obtain a new appropriative water right, a person must file a water right application with the State Water Board to appropriate water, obtain a water right permit, and use the water in accordance with the permit for a reasonable and beneficial purpose.[8] In part, the water right application must identify the nature and amount of the proposed use, the proposed place of diversion, the type of the diversion works, the proposed place of use, and sufficient information to demonstrate a reasonable likelihood that the unappropriated water is available for the proposed appropriation.[9] In acting on an application, the State Water Board must consider the relative benefit to be derived from all beneficial uses of water concerned, including the preservation and enhancement of fish and wildlife, and uses protected in a relevant water quality

[3] Wat. Code, § 174.
[4] Wat. Code, § 102.
[5] Wat. Code, § 1225; *People v. Shirokow* (1980) 26 Cal.3d 301, 308-309.
[6] Wat. Code, § 1201
[7] Wat. Code, § 5101. The section lists several exemptions from the filing requirement.
[8] Wat. Code, §§ 100, 275, 1252.
[9] Wat. Code, § 1260.

control plan.[10] The State Water Board may impose terms and conditions that will best develop, conserve, and utilize in the public interest the water sought to be appropriated, protect fish and wildlife, and carry out water quality control plans.[11] The State Water Board must also consider the public trust (discussed below).

The water right process is a three-stage process: (1) file an application and receive a permit, (2) diligently develop a water supply project consistent with the conditions of the permit and put water to beneficial use, and (3) receive from the State Water Board a license confirming the extent to which beneficial use of water was made. In issuing permits and licenses, or approving changes to those rights, the State Water Board may include terms and conditions to protect existing water rights, the public interest, and the public trust, and to ensure that water is put to beneficial use.

2.2 Overview of Groundwater Rights

Similar to surface water, percolating groundwater may be diverted under one of two basic types of rights: overlying or appropriative. Unlike surface water, a water right permit, license, or registration is not required to acquire an appropriative right to divert percolating groundwater. A permit, license, or registration is required, however, to acquire a post-1914 appropriative right to divert water from a subterranean stream flowing through a known and definite channel.[12]

2.3 Other State Water Board Authority

The State Water Board has the authority under article X, section 2 of the California Constitution and Water Code section 100 to prevent the waste or unreasonable use, unreasonable method of use, or the unreasonable method of diversion of all waters of the State. Water Code section 275 directs the State Water Board to "take all appropriate proceedings or actions before executive, legislative, or judicial agencies . . ." to enforce the constitutional and statutory prohibition against waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion, commonly referred to as the reasonable use doctrine. The reasonable use doctrine applies to the diversion and use of both surface water and groundwater, and it applies irrespective of the type of water right held by the diverter or user.[13]

The California Constitution also declares that the general welfare requires that the State's water resources be put to beneficial use to the fullest extent to which they are capable.[14] Therefore, in determining the reasonableness of a particular use of water or method of diversion, other competing water demands and beneficial uses of water must be considered. A particular water use or method of diversion may be determined to be unreasonable based on its impact on fish, wildlife, or other

[10] Wat. Code, § 1257
[11] Wat. Code, §§ 1253, 1257, 1257.5, 1258.
[12] Wat. Code, § 1200.
[13] *Peabody v. Vallejo* (1935) 2 Cal.2d 351, 366-367.
[14] Cal. Const., art. X, § 2.

instream beneficial uses.[15] What constitutes an unreasonable use, method of use, or method of diversion depends on the facts and circumstances of each case.[16] Under the reasonable use doctrine, water right holders may be required to endure some inconvenience or to incur reasonable expenses.[17]

The State Water Board also has a duty to protect, where feasible, the State's public trust resources.[18] The purpose of the public trust doctrine is to protect navigation, fishing, recreation, environmental values, and fish and wildlife habitat. Under the public trust doctrine, the State is the administrator of the public trust for the people of California. The State retains supervisory control over the navigable waters of the state and the lands underlying those waters.[19] The State's public trust responsibilities also extend to protecting navigable waters from harm caused by diversions from nonnavigable tributaries. Before the State Water Board approves an appropriative water right diversion, it must consider the effect of such diversions on public trust resources and avoid or minimize any harm to those resources where feasible. In applying the public trust doctrine, the State Water Board has the power to reconsider past water allocations even if the Board considered public trust impacts in its original water allocation decision.

Thus, the State Water Board may exercise its authority under the reasonable use doctrine and public trust doctrine to address diversions of surface water or groundwater for purposes of frost protection that reduce instream flows in the project area in a manner that adversely affects fish, wildlife, or other instream beneficial uses.

2.4 Water Quality Administration

2.4.1 Porter-Cologne Water Quality Control Act

California's primary authority for regulating surface and groundwater quality is the Porter-Cologne Water Quality Control Act (Wat. Code, § 13000 et seq.). Under the Porter-Cologne Act, the state is divided into nine regions. Within each region, a California Regional Water Quality Control Board has primary responsibility for protecting water quality. The State Water Resources Control Board oversees the regional water boards' implementation of the Porter-Cologne Act. As part of the Porter-Cologne Act, the regional water boards establish water quality control plans. The nine regional water quality control plans must identify beneficial uses for the waters within the region, water quality objectives which protect the beneficial uses, and a program of implementation to implement the water quality objectives. The water quality control plans serve as foundational documents for most of the regional

[15] *Environmental Defense Fund, Inc. v. East Bay Mun Utility Dist.* (1980) 26 Cal.3d 183.
[16] *People ex rel. State Water Resources Control Board v. Forni* (1976) 54 Cal.App.3d 743, 750.
[17] *Id.* at pp. 751-752.
[18] *National Audubon Society v. Superior Ct.* (1983) 33 Cal.3d 419, 446.
[19] *Id.* at p. 445.

water boards' other activities, such as investigating the quality of a region's waters, permitting activities that discharge waste, and enforcement actions.

Streams in the project area are subject to water quality regulation by the North Coast Regional Water Quality Control Board (North Coast Regional Water Board). The North Coast Regional Water Board is responsible for adopting and implementing the Water Quality Control Plan for the North Coast Basin (North Coast Basin Plan). The North Coast Basin Plan includes all the land area that drains into the Klamath River and North Coast basins, including the Russian River watershed.

Wetland and Riparian Area Protection Policy

The State Water Board is developing a statewide policy to protect wetlands and riparian areas that will be watershed-based. The proposed policy would ensure the protection of the vital beneficial services provided by wetlands and riparian areas, such as providing fish and wildlife habitat including unique plant communities (i.e., wetland and riparian vegetation), storing floodwaters, and maintaining surface water flows in dry periods. The policy is being developed in three phases: Phase 1 – establish measures to protect wetlands from dredge and fill activities, Phase 2 – establish measures to protect wetlands from all other activities impacting water quality, and Phase 3 – establish measures to protect riparian areas.

3 PROJECT DESCRIPTION

3.1 Background and Overview

As stated above, the proposed project is the adoption of a Russian River Frost Protection Regulation (proposed Regulation) for the Russian River watershed. The State Water Board's objective for the project is to establish a regulation that will prevent salmonid stranding mortality while minimizing the impacts of the regulation on the use of water for purposes of frost protection. In support of this objective, the State Water Board's goals are to (a) promote local development and governance of programs that prevent stranding mortality during the frost season, (b) provide transparency of diversion and stream stage monitoring data, (c) ensure that the State Water Board can require any changes to WDMP's that are necessary to ensure that WDMP's are successful and implemented on a timely basis, (d) provide for State Water Board enforcement against non-compliance, and (e) develop a comprehensive regulation that includes all diverters of water for frost protection use, including diverters who pump groundwater that is hydraulically connected to the stream system.

The proposed regulation would provide that, with the exception of diversions upstream of Warm Springs Dam in Sonoma County or Coyote Dam in Mendocino County, any diversion of water from the Russian River stream system, including the pumping of hydraulically connected groundwater, for purposes of frost protection from March 15 through May 15, shall be diverted in accordance with a board-approved water demand management program. The diversion of water in violation of the proposed regulation would be an unreasonable method of diversion and use and a violation of Water Code section 100. ~~water diversions from the Russian River stream system, including hydraulically connected groundwater, for purposes of frost protection from March 15 through May 15 are a violation of the prohibition against the unreasonable diversion or use of water, unless water is diverted in accordance with a Board approved water demand management program (WDMP), or the water is diverted upstream of Warm Springs Dam in Sonoma County or Coyote Dam in Mendocino County. In order to be approved,~~ The regulation would require a WDMP ~~would need~~ to include the following elements: (1) an inventory of the frost diversion systems within the area subject to the WDMP, (2) a stream stage monitoring program, (3) an assessment of the potential risk of stranding mortality due to frost diversions, (4) the identification and implementation of corrective actions necessary to prevent stranding mortality, and (5) annual reporting of program data, activities, and results.

NEED FOR THE REGULATION

The purpose of the proposed regulation is to prevent stranding mortality due to the cumulative effect of instantaneous diversions for purposes of frost protection of

crops. Frost protection of crops is a beneficial use of water under section 671 of title 23 of the California Code of Regulations (CCR). During a frost event, however, the high instantaneous demand for water for frost protection by numerous vineyardists and other water users may ~~reduce the flows in the Russian River stream system in ways that are harmful to salmonids~~contribute to a rapid decrease in stream stage[20] that results in the mortality of salmonids due to stranding. In a letter to the State Water Resources Control Board (State Water Board or Board) dated February 19, 2009, the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) requested that the State Water Board take immediate action, such as implementing emergency regulations, to address concerns that high instantaneous demand for water for frost protection may contribute to significant salmonid mortality. The letter documents two episodes of fish stranding mortality that occurred in April 2008, one on Felta Creek in Sonoma County, and the second on the mainstem of the Russian River, near Hopland in Mendocino County.

Coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*Oncorhynchus tshawytscha*), and steelhead (*Oncorhynchus mykiss*) all spawn and rear in the Russian River watershed. Chinook salmon and steelhead are listed as threatened pursuant to the federal ESA. Coho salmon are listed as endangered pursuant to the federal ESA and California ESA and are in danger of extinction in the Russian River. Stranding of juvenile salmonids can occur when flows decrease and water levels recede rapidly. For instance, NOAA (2009b) states juvenile salmonids may become stranded when side channels become disconnected from the main channel, or in extreme dewatering events when pools go dry (Bradford 1997, Hunter 1992). Stranding increases dramatically when flow drops below a certain water level, defined as the critical flow or stage (Hunter 1992). Because of the fragile nature of the fishery, regulatory action to protect this public trust resource is warranted.

Due to a lack of monitoring and eyewitnesses during early hours when frost events occur, there may have been more incidents of stranding than reported by NOAA Fisheries that have not been recorded. Stranded fish of concern tend to be juveniles. When mortality occurs, carcasses tend to be washed downstream and consumed by predators before the event is detected. Scientific research indicates that the two episodes of stream dewatering documented by NOAA Fisheries were not isolated incidents, and diversions for purposes of frost protection likely are adversely affecting salmonids throughout the Russian River watershed. Matthew J. Deitch, G. Mathias Kondolf, and Adina M. Merenlender (Deitch et al. 2009) studied the effects of dispersed, small-scale water projects on streamflow and aquatic ecosystems in the northern California wine country and published the results in a paper titled, “Hydrologic Impacts of Small-Scale Instream Diversions for Frost and Heat Protection in the California Wine Country.” Deitch et al. concluded that small instream diversions during frost events deplete streamflow over short durations. The report also indicates that small instream diversions on other tributaries in the Russian River watershed may have similar effects, and that the cumulative changes

[20] Stage is the level of the water in a river measured with reference to some arbitrary zero level or datum.

that small water diversions cause to the natural flow regime may play a principal role in limiting valued ecological resources such as anadromous salmonids.

The proposed regulation would ensure that tributaries are monitored to assess the extent to which frost diversions may affect stream stage and cause stranding mortality~~protected~~, in addition to the mainstem of the Russian River. According to NOAA Fisheries, conservation and monitoring in tributaries is critical because these are the areas that provide the majority of the salmonid habitat and where impacts of water diversions for frost protection are likely to be most acute. NOAA Fisheries presented the results of a proximity analysis at a State Water Board workshop in November 2009. The analysis showed that there are 60,640 acres of vineyard in the Russian River watershed. Seventy percent of those vineyards are within 300 feet of salmonid habitat. The Board estimates that approximately 21,198 acres of the vineyards and orchards in the Russian River watershed below Coyote Dam and Warm Springs Dam are frost protected with water from the Russian River stream system. Within the watershed, there are 1,778 miles of potential salmonid habitat. According to NOAA Fisheries, this entire habitat is needed for recovery of the three species listed above.

In this case, application of the reasonable use doctrine described in section 2.0, above, requires consideration of the benefits of diverting water for purposes of frost protection, the potential ~~harm to salmonids~~for frost diversions to cause stranding mortality, and the diverters' ability to frost protect without ~~adversely affecting salmonids~~cumulatively causing a reduction in stream stage that causes stranding mortality by coordinating or otherwise managing their diversions to reduce instantaneous demand. Deitch et al. suggest that, if properly managed, the abundance of flow that occurs during wet winters may provide enough water to meet human needs and protect instream uses. This may be accomplished by changing when the diversions occur. For example, water can be diverted to storage prior to a frost event, thereby reducing instantaneous demand during the event. As discussed in greater detail below, a number of other management tools also exist that can be used to reduce the instantaneous demand for water during frost events. ~~Given the impact to listed species and the availability of feasible alternatives to simultaneous diversions from the stream, uncoordinated, unregulated diversions of water from the Russian River stream system for purposes of frost protection are unreasonable~~Because a reasonable alternative to current practices exist, diversions of water for frost protection are unreasonable unless conducted in accordance with a board-approved water demand management program to reduce their instantaneous impact.

Adoption of the proposed regulation is necessary because many diverters in the Russian River watershed frost protect under a legitimate basis of right, such as an appropriative (permit, license, or pre-1914), riparian, or ground water right. Unless the State Water Board adopts this regulation, diverters will not necessarily know if their diversions are causing a problem. In addition, although by its terms article X, section 2 of the California Constitution is self-executing, without a comprehensive

WDMP, diverters are unlikely to coordinate and manage their diversions to ~~minimize the cumulative impacts of their diversions on fishery resources~~prevent cumulative diversions for frost protection from causing a reduction in stream stage that causes stranding mortality unless the Board takes steps to enforce the reasonable use doctrine by adopting this regulation or taking some other sort of enforcement action against them. Without a comprehensive regulation, the State Water Board would have to address diversions piecemeal, or in a complex and time-consuming adjudicative proceeding.

BACKGROUND

Water is diverted from the Russian River and its tributaries for a variety of purposes, including municipal, industrial, domestic, and agricultural use. Two major reservoirs provide water supply storage in the Russian River watershed: Lake Mendocino, formed by Coyote Dam on the East Fork Russian River, and Lake Sonoma, formed by Warm Springs Dam on Dry Creek, a major Russian River tributary. Sonoma County Water Agency (SCWA) operates Lake Mendocino and Lake Sonoma for water supply purposes in accordance with State Water Board Decision 1610, which set instream flow requirements for the mainstem Russian River below Lake Mendocino and for Dry Creek below Lake Sonoma. SCWA, the Mendocino County Russian River Flood Control and Water Conservation Improvement District, as well as the Redwood Valley County Water District hold water rights to divert from the East Fork Russian River at Lake Mendocino for various uses, including municipal and irrigation uses in Mendocino and Sonoma Counties.

Numerous other public and private entities divert from the Russian River and its tributaries as well. In total there are about 1,778 water rights, water right claims, and pending water right applications in the Russian River watershed. Of this total, 533 records, or 30 percent, provide for the diversion of water for frost protection use.

REGULATORY PRECEDENT

The State Water Board previously adopted a regulation regarding frost protection in the Napa River watershed. Under section 735 of the State Water Board's regulations (California Code of Regulations, title 23), all diversions of water from the Napa River stream system between March 15 and May 15 determined to be significant by the Board or a court of competent jurisdiction shall be considered unreasonable and a violation of Water Code Section 100 unless controlled by a watermaster administering a Board or court approved distribution program. Diversions for frost protection and irrigation during this period are restricted to: (1) replenishment of reservoirs filled prior to March 15 under an appropriative water right permit, or (2) diversions permitted by the court.

In 1974, the State Water Board initiated an action in court to enjoin riparian water users on the Napa River from the direct diversion of water for frost protection of Napa Valley vineyards, charging that the diversions were an unreasonable method

of diversion of water because the diversions created a high instantaneous rate of demand which depleted the flow of the river during certain periods of time during the frost season. The Board concluded that the only feasible solution to the problem was (1) to require the winter storage of water for frost protection, and (2) to develop other supplemental sources of water so that no direct pumping of water for frost protection would be necessary. On appeal, the First District Court of Appeal concluded that in order to attain the constitutional mandate that waters be put to reasonable and beneficial use, riparian water users could be required to endure some inconvenience and reasonable expense. (*State Water Resources Control Board v. Forni* (1976) 54 Cal.App.3d 743, 751-752.) The Court further upheld section 659 of the State Water Board's regulations (subsequently renumbered as California Code of Regulations, title 23, section 735).

At a State Water Board workshop on April 7, 2009, Kevin Taylor, Department of Water Resources; and Drew Aspegren, Napa Valley Vineyard Engineering, gave a presentation regarding the Napa Watermaster perspective and experience. The Napa regulation has been successful and is an example where diverters have used offstream storage and coordinated their diversions in order to reduce instantaneous demand on the stream system.

DEMAND MANAGEMENT

Proper management of diversions for frost purposes can reduce the instantaneous demand on the stream system. For instance, a grower may have a vineyard with a variety of crops, which bud out at different rates, planted at various elevations. There may be instances when only certain varietals or crops at certain elevations require frost protection. By placing valves in the frost system, the grower could control which areas to frost protect and not needlessly frost protect the entire property. Growers may also frost protect on days where there is no frost requirement merely as a precautionary practice. A grower may suspect that a frost event will occur and begin frost protection only to find out later that it was unnecessary. More sophisticated frost forecasting and on-site wet bulb[21] monitoring may reduce the need to frost protect on certain days. A third management practice to reduce the instantaneous demand on the stream system is for the grower to only frost protect for the amount of time necessary. A grower may turn on sprinklers and leave them on longer than necessary, again as a precautionary practice against frost damage. It is possible that closer monitoring of frost events, wet bulb temperature, etc., could reduce the amount of water required to frost protect.

Additional ways in which diversions may be managed include, but are not limited to, (1) timed releases from Lake Mendocino and Warm Springs Dam in anticipation of a frost event to meet the increased demand downstream, (2) build offstream reservoirs to allow storage in the winter prior to the frost season and for refill during non-peak hours after frost events, (3) install wind machines, (4) install cold air drains, (5) use

[21] The wet bulb is the air temperature that occurs when heat is removed from the air to evaporate water until the air becomes saturated. It is measured with a psychrometer or calculated from dew point and air temperature.

heaters, (6) install wells that attenuate or eliminate the ~~impact of diversions~~rapid decrease in ~~on~~ stream stage that results in mortality of salmonids due to stranding, (7) conserve water through best management practices, (8) switch to less frost sensitive varietals, or (9) a combination of the methods described above.

WATER DEMAND MANAGEMENT PROGRAM (WDMP)

The two episodes of fish stranding mortality that occurred in April 2008 indicate that at times the cumulative demand for water for frost protection in a watershed may be greater than the available supply and salmonid needs. If the cumulative demand for frost protection exceeds the supply, when taking into account the needs of fishery resources, then that demand needs to be managed. An over-arching water demand management program for frost diversions will serve to ~~protect fishery resources~~prevent salmonid stranding mortality caused by frost diversions.

The adoption of the proposed regulation allows water users to divert water for frost protection provided they are in accordance with a WDMP that has been approved by the State Water Board. Any WDMP must ensure that the cumulative diversion rate for frost protection of the participants in the WDMP will not ~~result in a reduction in stream stage that is harmful to salmonids~~contribute to a rapid decrease in stream stage that results in the mortality of salmonids due to stranding. The regulation would allow for multiple programs, should a WDMP need to be tailored to a specific geographic area or other situation. The WDMP would be administered by an individual or governing body (governing body) capable of meeting the requirements of the regulation.

The regulation would require a WDMP to include the following elements: (1) an inventory of the frost diversion systems within the area subject to the WDMP, (2) a stream stage monitoring program, (3) an assessment of the potential risk ~~assessment~~,of stranding mortality due to frost diversions (4) ~~development~~ identification and implementation of ~~a~~ corrective actions ~~plan if~~ necessary to prevent stranding mortality, and (5) annual reporting ~~to the Board~~of program data, activities, and results.

The frost inventory would be required to include the name of the diverter; the source of water used and diversion location; a description of the diversion system and its capacity; acreage served; and the rate of diversion, hours of operation, and volume of water diverted during each frost event. Because conditions of many permits and licenses and the recent legislative changes to Water Code section 5103, subd. (e), require that surface diverters install and maintain measuring devices using best available technology and best engineering practices to measure their diversions, this regulation does not need to specify such requirements.

The regulation would require the governing body to develop a stream stage monitoring program in consultation with NOAA Fisheries and the Department of Fish and Game (DFG). The program would involve identification of critical stream

reaches where stream stage monitoring gages would be installed and, at a minimum, a determination of the stream stage that would protect salmonids from stranding mortality for each stream reach being monitored by each installed gage. The program would include the installation, calibration and maintenance of the gages; and monitoring and recording of stream stage data at intervals not to exceed 15 minutes.

Based on the frost inventory and stream stage information described above, and information concerning the presence of habitat for salmonids, the regulation would require the governing body to conduct a risk assessment that evaluates the potential for frost diversions to cause fish stranding and mortality and warn growers of the potential risk.

The WDMP would not immediately require frost diverters to implement corrective actions such as conversion to alternative water sources, or implementation of best management practices (BMPs). Rather, the WDMP would require the governing body to perform an annual risk assessment. If a potential risk is identified, the governing body, in consultation with the diverters, would develop a corrective action plan, which the diverters would be required to implement. In developing the corrective action plan, the governing body shall consider the relative water right priorities of the diverters and any time delay between groundwater diversions and a reduction in stream stage. To the extent feasible, the corrective action plan shall include interim corrective actions if long-term corrective actions are anticipated to take over three years to fully implement.

The proposed regulation would require the governing body responsible for administering the WDMP to prepare and submit to the Board ~~an~~ annual report<u>s</u> that includes (1) the frost inventory, including diversion data, (2) stream stage monitoring data, (3) the risk assessment and its results, ~~and~~ (4) a description of any corrective action plan developed by the governing body, any corrective actions identified or implemented to date, and a schedule for implementing any additional corrective actions<u>, and (5) any instances of noncompliance with the WDMP or with a corrective action plan</u>. ~~The~~ <u>Annual</u> report<u>s</u> would also be required to assess whether the requirements of the program were met during the preceding year, evaluate the effectiveness of the WDMP, and recommend any necessary changes to the program prior to the next frost season. The State Water Board will annually review the WDMP, and may require changes to the WDMP, including but not limited to the risk assessment, corrective action plan, and schedule of implementation, at any time.

The Board recognizes that that it may take time for aspects of the WDMP to be completed, such as the identification of all sensitive stream reaches, installation of stream gages, completion of a comprehensive risk assessment, and implementation of any necessary corrective actions. The regulation would require any WDMP to include a schedule for conducting the frost inventory, developing and implementing the stream stage monitoring program, and conducting the risk assessment. As stated above, ~~the~~ annual report<u>s</u> would be required to include a schedule for

completing any necessary corrective actions that remain to be implemented. In addition, the regulation would allow for annual updates to the WDMP that may include revisions to risk assessments and updates to corrective action plans.

ENFORCEMENT

Diverting water for purposes of frost protection in violation of the proposed regulation or failure to take corrective action prescribed by the governing body would be an unreasonable method of diversion and use and a violation of Water Code section 100, and would be subject to enforcement action by the State Water Board. In addition, the proposed regulation provides that compliance with the regulation shall constitute a condition of all water right permits and licenses that authorize the diversion of water from the Russian River stream system for purposes of frost protection. This includes permits and licenses authorizing diversions from March 15 through May 15 for agricultural or irrigation use that were issued by the Board prior to 1979, when frost protection became a separate use under the Board's regulations. The purpose of this provision is to make compliance with the regulation ~~an~~ enforceable ~~condition of permits and licenses~~.

3.2 Geographic Scope

The Russian River flows approximately 110 miles from the Ukiah Valley in Mendocino County to the mouth of the River at the Pacific Ocean in Sonoma County. According to NOAA Fisheries Service, this area provides 1,778 miles of potential salmonid habitat. Except for diversions above Coyote Dam and Warm Springs Dam, the proposed Regulation will cover the geographic area of the Russian River and its tributaries in Mendocino and Sonoma Counties. The proposed regulation would also extend to hydraulically connected groundwater. The project area is shown in figure 3-1, and the environmental setting of the project area is generally characterized in section 4.0.

DIVERSIONS ABOVE COYOTE DAM AND WARM SPRINGS DAM

The proposed regulation would not apply to diversions above Coyote Dam or Warm Springs Dam because those two dams are barriers to salmonid migration. Accordingly, diversions for purposes of frost protection above the dams do not have the potential to ~~harm~~ contribute to a rapid decrease in stream stage that results in the stranding mortality of threatened or endangered salmonids above the dams. In addition, any potential effects of diversions at or above the dams on salmonids below the dams would be mitigated by the large storage capacity of the reservoirs and the instream flow requirements imposed by Decision 1610. The regulation would apply, however, to water released from Lake Mendocino or Lake Sonoma and subsequently rediverted at downstream points of diversion. The uncoordinated diversion or rediversion of water below Coyote Dam or Warm Springs Dam does have the potential to ~~harm salmonids~~contribute to a rapid decrease in stream stage that results in the mortality of salmonids due to stranding, despite the instream flow

requirements imposed by Decision 1610, as evidenced by the fish stranding mortality event on the mainstem of the Russian River in April, 2008.

GROUNDWATER

The proposed regulation would apply to groundwater pumped for the purpose of frost protection that is hydraulically connected to the Russian River or its tributaries. ~~The regulation would define hydraulically connected groundwater to include all groundwater pumped from the Russian River stream system.~~ For purposes of the proposed regulation, groundwater pumped within the Russian River watershed would be considered hydraulically connected to the Russian River stream system if that ~~, unless the user can demonstrate to the Board's satisfaction that the source is not hydraulically connected to the Russian River or its tributaries~~pumping contributes to a reduction in stream stage to any surface stream in the Russian River watershed during any single frost event.

Hydraulically connected groundwater most likely includes groundwater within specified areas delineated on maps prepared by Stetson Engineers (Stetson) during development of the Policy for Maintaining Instream Flows in Northern California Coastal Streams, (Stetson, 2008). The areas in question encompass subterranean flows and potential stream depletion areas identified in the maps' legends as follows:

- Subterranean Flow,
- Potential Stream Depletion Area, and
- Mapped stream channel and associated alluvial deposits within a potential stream depletion area. Wells pumping from these deposits are likely to result in greater and more immediate stream depletion.

The proposed regulation would apply to groundwater because groundwater pumping can contribute to a cumulative reduction in stream stage during a frost event. In the Russian River watershed where streams and adjacent alluvial aquifers are hydraulically connected, groundwater pumping threatens streamflow by depletion (Stetson, February 2008). Stream depletion from wells can result from direct depletion of the stream or reduction of groundwater flow to the stream. Groundwater moves laterally from alluvial deposits to the stream channel deposits and then is discharged to the stream baseflow. Wells pumping from the subterranean streams and potential stream depletion areas delineated on Stetson's maps are likely to intercept groundwater moving toward the stream which would ultimately discharge to the stream. As stated in section 2.0, above, the State Water Board has the authority to prevent waste or unreasonable use or unreasonable method of use of all water resources of the state, including percolating groundwater.

Insert Figure 3-1

Figure 3-1. Project Area Map

4 EXISTING ENVIRONMENTAL SETTING

This section provides general descriptions of selected resource areas as a context for other discussions in the document. As previously shown in figure 3-1, the project area covers the majority of the Russian River watershed, excluding the watershed area above Warm Springs Dam and Coyote Dam. This area comprises approximately 2800 stream miles and encompasses approximately 800,012 watershed acres (1250 square miles) in Sonoma and Mendocino counties. The descriptions are not intended to be a comprehensive characterization of the entire project area.

4.1 Geologic Setting

The project area is located in the Coast Ranges Geomorphic Province. The area is generally hilly and mountainous, except for about 250 square miles of relatively flat area (slopes less than 4 percent). Elevations generally vary from sea level at the mouth of the Russian River to over 4,000 feet above mean sea level (msl).

The Coast Ranges are composed of thick Mesozoic and Cenozoic sedimentary strata. The coastline of the Pacific Ocean is generally uplifted, terraced, and wave-cut. The southern end of the northern Coast Ranges is marked by a depression containing San Francisco Bay. The northern Coast Ranges are dominated by the irregular, knobby, landslide-prone topography of the Franciscan Complex. The eastern portion of the range is characterized by strike-ridges and valleys in Upper Mesozoic strata. In several areas, Franciscan rocks are overlain by volcanic cones and flows of the Quien Sabe, Sonoma, and Clear Lake volcanic fields. The Franciscan rocks and, to a lesser degree, the younger volcanics, have been folded, faulted, and eroded to form northwest-trending ridges and valleys, which are nearly parallel to the active San Andreas Fault, a major fault zone extending from Point Arena to the Gulf of California (California Geological Survey 2002).

Some valleys in the project area are broad and flat and contain thick sedimentary deposits (U.S. Geological Survey 1967). Some gradient valleys contain thick deposits of gravel derived from the erosion of surrounding mountains, and others are steep and narrow, actively eroding, and contain relatively little alluvial gravel. Many channels are incised in response to tectonic and erosion processes, land use practices resulting in the loss of a stabilizing riparian zone, and increased peak flows in urbanized settings (Haltiner et al. 1996, cited in R2 Resource Consultants 2007). Valleys generally follow zones of brecciated rock along folding and fault lines, where hummocky topography and landslides are prominent features of the landscape (Rantz and Thompson 1967, Kondolf et al. 2001, cited in R2 Resource Consultants 2007).

4.2 Hydrology and Water Quality

Streams in the project area have distinct seasonal runoff patterns, reflecting low amounts of precipitation from June through September. The climate is characterized as Mediterranean, with mild wet winters and cool dry summers along the coast; summer temperatures are considerably warmer in the inland valleys than in the coastal basins. Rantz and Thompson (1967) estimated that about 80 percent of the total precipitation in the area falls during five months, from November through March (R2 Resource Consultants 2007).

The relatively low elevations of the mountains in the project area produce little snowmelt runoff. Mean annual precipitation ranges from approximately 25 inches in the southwestern portion of the watershed to approximately 60 inches over Walbridge ridge and other high mountain divides. Mean annual precipitation is strongly influenced by altitude and the steepness of the coastal mountain slopes. About 80 percent of the total annual runoff occurs during the four months of December through March. Rains during November generally contribute little runoff and are instead absorbed by the ground. The bulk of precipitation typically falls during several storms each year. There is a small lag between rainfall and runoff once ground conditions become more saturated in November, reflecting low soil and surface rock permeability and a limited capacity for subsurface storage (Rantz and Thompson 1967, cited in R2 Resource Consultants 2007). This relationship between rainfall and ground conditions results in streams with relatively "flashy" storm runoff hydrographs.

Compared with flows during winter, stream flows during summer and early fall are generally low, and many small streams in the project area may go dry. Because of the low infiltration capacity and permeability of the Franciscan and volcanic rocks, summer baseflows in streams are poorly maintained. Along the mountain drainages, baseflow that does occur is maintained by groundwater discharge emerging from fractures through springs and seeps. As a result, some streams may be composed of discontinuous wet reaches with pools sustained over the summer by groundwater discharge. Some higher elevation streams may run dry from summer to late fall. Some streams flow throughout the dry season during wet years, maintain isolated pools in average years, and have no water in them in dry years (Opperman 2002, cited in R2 Resource Consultants 2007). In the valleys, groundwater occurs in the alluvial deposits. There, summer baseflow is maintained by groundwater discharge along reaches where the water table is higher than the adjacent stream. In the larger valley drainages, such as the Russian River (figure 4-1), groundwater discharge is large enough to sustain perennial flow.

As a result of the low water yield of the Franciscan and volcanic rocks, groundwater development in the mountainous areas is limited. Well yields are low, typically on the order of a few gallons per minute; however, in some locations, the yields are sufficient for domestic, stock pond, or small-scale irrigation purposes. The vast majority of groundwater development occurs in the larger valley drainages,

particularly the Russian River, where urban water purveyors operate extensive wellfields. Some wells in these areas yield as much as 3,000 gallons per minute (California Department of Water Resources 1975, cited in R2 Resource Consultants 2007). Figure 4-2 shows the groundwater basins in the project area.

Insert Figure 4-1

Figure 4-1. Major Rivers and Watershed Areas

Insert Figure 4-2

Figure 4-2. Groundwater Basins

4.2.1 Water Quality

The project area includes portions of the region administered by the North Coast Regional Water Quality Control Board. In the discussion below, impaired waters are those that do not meet Clean Water Act (CWA) water quality standards and are listed as water quality impaired under section 303(d) of the CWA (33 U.S.C. § 1313(d)). Under the CWA, states must identify these waters and determine a total maximum daily load (TMDL). A TMDL sets the maximum amount of pollution a water body can receive without violating water quality standards.

The region administered by the North Coast Regional Water Board covers approximately 10 percent of the State; however, the region yields about 40 percent of the surface water in California. The region is characterized by numerous rivers and streams of the highest quality, with vast areas of wilderness and managed forests. Most significant point source discharges are well regulated and significant progress has been made with non-point sources. In addition to monitoring point sources and working with resource users to enhance beneficial uses, the primary focus is pollution prevention. While only a small fraction of the waters have been assessed, these were generally found to be of good or intermediate quality.

Section 303(d) of the federal Clean Water Act (33 U.S.C. § 1313(d)) and 40 Code of Federal Regulations section 130.7 require states to identify water bodies that do not meet water quality standards and are not supporting their beneficial uses. These waters are placed on the Section 303(d) List of Water Quality Limited Segments (also known as the List of Impaired Waterbodies). The List identifies the pollutant or stressor causing impairment and establishes a schedule for developing a control plan to address the impairment. On August 4, 2010 the State Water Board approved the California 2010 303(d) list. This list includes the following impairments for the Russian River watershed within the project area: sedimentation/siltation, water temperature, indicator bacteria, mercury, specific conductivity, dissolved oxygen, nitrogen, and phosphorus. The distribution of these impairments is depicted in Figure 4-3.

Insert Figure 4-3

Figure 4-3. 2010 CWA Section 303(d) List of Water Quality Limited Segments, Russian River Hydrologic Unit

The primary reason for listing of surface waters in the North Coast region as impaired is excessive sedimentation (The North Coast Regional Partnership and Del Norte, Humboldt, Mendocino, Modoc, Siskiyou, Sonoma and Trinity Counties 2005). Identified sediment sources include erosion from logged lands, agriculture, construction sites, and runoff and sediment transport from urban and residential areas. Sediments result in a reduction in water quality and can also affect beneficial uses of those waters including uses associated with the migration, spawning, reproduction, and early development of coldwater anadromous fishes such as coho salmon and Chinook salmon.

Sediment and temperature are the most common pollutant stressors in the Russian River watershed. Other pollutant stressors in streams and tributaries in the watershed include indicator bacteria, nutrients, mercury, specific conductivity, and low dissolved oxygen. Sources of pollutants can vary greatly but may include storm water runoff; erosion and sedimentation from roads, agriculture, and timber harvest; channel modification activities; gravel mining and dairy operations; failing septic tanks; and contamination from gas stations and industrial activities (North Coast Regional Water Quality Control Board 2010).

4.3 Plant Communities

To generally characterize the plant communities within the large scale of the project area, a hierarchical framework of ecological units can be used. The project area can be described as part of two large “sections” in two larger “provinces”: the Northern California Coast section of the California Coastal Steppe, Mixed Forest, and Redwood Forest Province, and the Northern California Coast Ranges section of the Sierra Steppe-Mixed Forest-Coniferous Forest Province (USDA Forest Service 1997, Sawyer and Keeler-Wolf 1995). These ecological areas are shown in figure 4-4.

Figure 4-4. Ecological Subregions of the Project Area

4.3.1 Coastal Steppe, Mixed Forest, and Redwood Forest Province

The Northern California Coast Section of the Coastal Steppe, Mixed Forest, and Redwood Forest Province covers the majority of the western region of the project area. This section is further divided into two subsections. The Coastal Franciscan subsection, extends from southern Humboldt County south through Mendocino County into Sonoma County. The predominant natural plant communities of the Coastal Franciscan subsection include redwood series, Douglas-fir–tanoak series, and needlegrass grasslands in the north and Douglas-fir–tanoak series in the central and southern interior parts of this subsection. Canyon live oak series is common on very steep slopes. Sergeant cypress series is found on serpetinitic soils. Black cottonwood series is common in riparian areas. Characteristic plant series by lifeform in this subsection include grassland, shrublands, forests, and woodlands.

The broad northwest-trending valley of the Santa Rosa Plain and the rolling hills between that plain and the ocean are recognized as the Santa Rosa Plain Subsection. The predominant natural plant communities in this area are needlegrass grasslands and valley oak series in inland valleys. Northern claypan vernal pools occur on the Santa Rosa Plain, and Pacific reedgrass and needlegrass series occur on the rolling hills between the plain and the coast. Coast live oak is common on leeward slopes. Characteristic plant series by lifeform in this subsection include dune vegetation, saltmarsh, grasslands, vernal pools, shrublands, forests, and woodlands.

4.3.2 Sierra Steppe-Mixed Forest-Coniferous Forest Province

In the other ecological region, or province - the Sierra Steppe-Mixed Forest-Coniferous Forest Province - one section is represented in the project area: the Northern California Coast Ranges section. This section is the interior part of the northern California Coast Ranges mountains. This section includes portions of Mendocino and Sonoma Counties within one subsection, the Central Franciscan Subsection. The predominant natural communities in the Central Franciscan Subsection are the Douglas-fir–tanoak series with needlegrass grasslands and Oregon white oak in the northern part; and a mosaic of mixed conifer series, needlegrass grasslands, blue oak series, and chamise series in the southern part. Characteristic plant series by lifeform in this subsection include grasslands, shrublands, forests, and woodlands.

4.4 Riparian Communities

Riparian communities provide a crucial link between terrestrial and aquatic ecosystems, forming a unique and distinct unit within the surrounding landscape. The riparian zone can be considered essentially as the terrestrial component of the stream environment. Riparian zones are typically subject to partial or complete flooding, and riparian vegetation is adapted to the particular climatic and topographic attributes of the zone. Riparian habitat includes trees, other vegetation, and physical

features normally found on the banks and floodplains of rivers, streams, and other bodies of fresh water.

Close relationships exist among the riparian zone, the fluvial processes of the channel, and fish habitat. Native vegetation in riparian zones offers habitat for terrestrial wildlife by supplying food and shelter. Additionally, riparian vegetation provides detritus or vegetable matter, which breaks down and provides food for aquatic invertebrates. Fallen branches, large woody debris, and aquatic plants provide habitat for instream fauna such as native fish and crustaceans (Fowley and Ridgway, 2000).

Intact, mature riparian forests tend to be a dense tangle of large trees in the over-story, and smaller trees, vines, downed wood, and various herbs and fungi in the under-story. The diversity of plants and complexity of habitats in these mature riparian forest zones support an incredible number of animal species (Circuit Rider Productions, Inc., 2003). Riparian areas support the salmonid life cycle and an abundance of other wildlife species (Circuit Rider Productions, Inc., 2003). Over 225 species of birds, mammals, reptiles, and amphibians depend upon California's riparian habitats (Knopf et al. 1988, Saab et al. 1995, Dobkin et al. 1998, Clemons 2003, cited in R2 Resource Consultants 2007). The northern coastal streams in California support up to 15 percent of the pre-1840 riparian vegetation (Katibah 1984, Clemons 2003, cited in R2 Resource Consultants 2007).

Riparian habitat is important for fish and other aquatic and terrestrial species throughout the project area. Beach (1996, cited in R2 Resource Consultants 2007) noted that about 50 percent of reptiles and 75 percent of amphibians in California are dependent on riparian habitat. The riparian zone serves numerous physical and ecological functions for fish in project area streams including providing instream habitat structure, bank stability and erosion prevention (lateral and vertical), bank cover, shade and temperature control, organic nutrient material, insects for fish food, and other functions.

Large woody debris is more important for habitat structure in streams with conifer-dominated riparian zones, and less prevalent in hardwood dominated streams, primarily because of size differences between hardwood and conifer pieces.

Riparian communities in the project area have been described as one of three broad types: headwaters areas, mid-level areas, and broad valley floodplains (Roberts 1984, cited in R2 Resource Consultants 2007). In headwaters areas, stream channels are often actively eroding close to or at bedrock. Riparian vegetation composition and density reflect the ability of plants to find a foothold and nourishment in thin alluvial soils covering the bedrock. Unimpacted stream flow regimes in most cases provide adequate year-round water for riparian vegetation. In mid-level areas, most streams contain gravel bars and sand flats that support riparian vegetation, often in narrow strips between the stream and bedrock hillslopes. The vegetation is relatively susceptible to scouring during floods, with recolonization depending on seed source proximity to the channel and dispersal

mechanisms. Riparian groves are found in wider valleys with terraces. In the third community type, broad-valley floodplain areas, deposition of a thick sediment layer near abundant water is associated with riparian gallery forests. Colonization processes occur rapidly, although this community is influenced heavily by land use practices including clearing and grading (Roberts 1984, cited in R2 Resource Consultants 2007).

Floodplain riparian forests are among the most important, and most impacted, habitats in California. The area and diversity of the riparian zone in the Russian River watershed have been reduced considerably from historic levels by a variety of land uses. Many of the areas that historically supported floodplain wetlands and riparian forests in a mature stage have been converted to agricultural lands. The construction of large dams on the East Fork of the Russian River and Dry Creek has influenced characteristic flow and sediment transport regimes, which in turn have likely influenced the extent and characteristics of the riparian zone as well. Most of the riparian community in the basin is dominated by hardwood species such as California bay laurel, white alder, and various oak and willow species. However, several invasive species, particularly giant reed *(Arundo donax),* are changing the riparian zone community structure at isolated locations in the basin (Florsheim et al. 1997, Opperman 2002, Opperman and Merenlender 2003, cited in R2 Resource Consultants 2007).

4.5 Wetlands

Wetlands are areas that are regularly saturated by surface water or groundwater for all or part of the year including the growing season. They are transitional areas between terrestrial and aquatic ecosystems, and are characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions. Wetlands are highly productive and complex ecosystems that provide a number of functions of value to the human and natural environment in terms of water quality, hydrologic functions, and habitat. Wetland functions include groundwater recharge; floodflow storage, dampening, and modification; shoreline and bank stabilization; sediment and toxicant retention; nutrient removal or transformation; production export (organic matter formed in a wetland transported downstream and used by other organisms); aquatic diversity and abundance; and terrestrial diversity and abundance. These functions in turn contribute to many human benefits and values, including flood control, food production, fishing and hunting, recreation, and aesthetics (Schneider and Sprecher 2000; EPA 2007). All of these functions, benefits, and values are associated with wetlands in the project area.

A number of classification systems have been developed for describing wetlands. One well recognized system is the classification system used by the National Wildlife Inventory (NWI), which is based on the classification system of Cowardin and others (1979). The NWI system defines types of wetlands by systems, subsystems, and classes (further refined in terms of subclasses and modifiers). A wide range of wetland types occurs in the project area, within all the main NWI wetland systems:

marine (intertidal), estuarine (pertaining to estuaries), lacustrine (pertaining to lakes), riverine (pertaining to rivers), and palustrine (which includes all wetlands not assignable to any of the four other systems).

4.6 Anadromous Fish

The Russian River stream system provides habitat for steelhead trout, Coho salmon, and Chinook salmon. These fish species are anadromous salmonids, which migrate from salt water to spawn in fresh water. The National Marine Fisheries Services (NMFS) and the California Department of Fish and Game (DFG) have listed steelhead trout and Chinook salmon as "threatened" under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA), respectively. Coho salmon are listed as "endangered" on both the ESA and the CESA lists.

The primary habitat requirements for anadromous salmonids during the frost diversion season are passage, spawning, incubation, rearing, and emigration. In general, spawning habitats in area streams tend to be more evenly distributed in lower gradient channels, while in higher gradient channels, spawning areas are sporadic and often limited to distinct patches or pockets, a result of gravel supply, transport, and deposition patterns.

The ability of anadromous salmonids to use these spawning habitats and negotiate passage barriers is strongly dependent on flow magnitude and duration, stream gradient, and channel shape and size (Rantz 1964; MTTU 2000, cited in R2 Resource Consultants 2007). In the smallest streams, passage may occur only during high water events. Spawning occurs in areas with suitable gravel quality and quantity, during freshets and/or winter base flows. Rearing generally requires deeper water and cover that can be provided in the form of large substrate, overhanging vegetation, or undercut banks.

In project area streams, the availability of rearing habitat is generally controlled by summer and winter base flows. A more detailed description of anadromous salmonids habitat requirements is provided in appendix D of R2 Resource Consultants 2007.

4.6.1 Listing of Salmonid Species under Federal and State Endangered Species Acts

NMFS and CDFG listed coho salmon as "threatened" under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA), respectively, in 1996, followed in later years by the listing of steelhead and Chinook salmon. In 2005, the status of coho salmon was changed to "endangered" under both the ESA and CESA. NMFS and CDFG identified critical habitat for steelhead and Chinook salmon on a stream-by-stream basis in the project area. Critical habitat for coho is defined by NMFS as any accessible stream within the current range of designated populations, excluding habitat above a specific number of impassable dams but including habitat above culverts. The listing of these fish under the federal and state

endangered species acts led to the need for the evaluation of the impacts of water diversions on anadromous salmonids. Figures 4-5a through c show major river basins within the current known ranges of steelhead, coho, and Chinook salmon.

Insert Figure 4-5 a, b, c

Figure 4-5a. Central California Coast Steelhead Designated Critical Habitat

Insert Figure 4-4b

Figure 4-5b. Central California Coho Designated Critical Habitat

Insert Figure 4-5c

Figure 4-5c. California Coastal Chinook Designated Critical Habitat

The listing status and ranges of the listed anadromous salmonid species within the project area are provided in table 4-1. The table also shows the dates they became listed under either the ESA or the CESA, or both, and, in some cases, the dates their listing status was reaffirmed.

Table 4-1. State and Federal Special-Status Species of Anadromous Salmonids in the Project Area

COMMON NAME	STATE STATUS	FEDERAL STATUS	POPULATION RANGE
Coho salmon – Central California Coast ESU* *(Oncorhynchus kisutch)*	Endangered (3/30/05)	Endangered (8/29/05)	From the San Lorenzo River in Santa Cruz County north to Punta Gorda (in Humboldt County), including tributaries to San Francisco Bay, but excluding the Sacramento–San Joaquin River system
Steelhead – Central California Coast DPS (*Oncorhynchus mykiss irideus*)		Threatened (8/18/97; 1/5/06)	From the Russian River south to Aptos Creek (Santa Cruz Co.), and the drainages of San Francisco, San Pablo, and Suisun Bays, including the tributary streams to Suisun Marsh, but excluding the Sacramento–San Joaquin River system
Chinook salmon – California Coastal ESU *(Oncorhynchus tshawytscha)*		Threatened (9/16/99; 6/28/05)	South of the Klamath River to the Russian River

*The term Evolutionarily Significant Unit (ESU) refers to a population of organisms that is considered distinct for purposes of conservation and for listing under the federal Endangered Species Act. The concept refers not to taxonomic groupings but to identifiable populations that are substantially reproductively isolated from other conspecific populations and that represent important components of the evolutionary legacy of the species. NMFS's ESU regulation for Pacific salmon defines the criteria for identifying a Pacific salmon population as a distinct population segment (DPS), which can be listed under the ESA (NMFS 2007).

4.6.2 Description of Salmonid Species

Steelhead

There are two basic life history types of steelhead: summer (stream-maturing) steelhead and winter (ocean-maturing) steelhead. Steelhead in the project area are winter steelhead.

Winter steelhead upstream migration generally extends from November through May, peaking in most area streams during January and February. Winter steelhead spawn within a few weeks to a few months from the time they enter fresh water. Peak spawning occurs during January through March, but can extend into spring and early summer months. The eggs hatch in approximately 3 to 4 weeks, with fry emerging from the gravel 2 to 3 weeks later. The fry then move to shallow protected

areas associated with the stream margin for several weeks (Moyle 2002, cited in R2 Resource Consultants 2007).

Steelhead typically spend 2 years in freshwater, but freshwater residence time can range from 1 to 4 years (McEwan and Jackson 1996, Moyle 2002, cited in R2 Resource Consultants 2007). Emigration in the area usually occurs in late winter and spring and in some cases in the late fall months. Steelhead typically spend 1 to 2 years in the ocean before returning to spawn for the first time. In addition, steelhead are iteroparous[22] and may return to the ocean and spawn again in a later year.

Coho Salmon

In California, coho salmon have a relatively strict 3-year life cycle, spending about half of their lives in fresh water and half in salt water (Moyle 2002, cited in R2 Resource Consultants 2007). Upstream migration occurs primarily from October through January, with peak migration occurring during November and December. Peak spawning for coho salmon occurs during the months of December and January, taking place in small area streams. The eggs hatch after incubating in the gravels for 8 to 12 weeks (Moyle 2002, cited in R2 Resource Consultants 2007). After hatching, the alevins[23] remain in the gravel for 4 to 10 weeks depending on current water temperatures. Upon emergence, coho salmon fry tend to move to shallow water areas where they feed and continue to grow into juveniles. Juvenile coho rear and overwinter in the stream until the following March or early April, when, after smoltification, they begin migrating downstream to the ocean. In California, peak downstream migration occurs from April to late May/early June.

Chinook

Adult Chinook salmon begin returning to the Russian River as early as late August through January, but most upstream migration occurs in late October through mid-December (Steiner 1996, Chase et al. 2000, Chase et al. 2001, cited in R2 Resource Consultants). The location of spawning will vary from one year to another depending on the timing and amount of fall and winter rains (Flosi et al. 1998, cited in R2 Resource Consultants 2007). The eggs hatch within 4 to 6 weeks and young salmon generally begin outmigration soon after they emerge from the substrate in spring. Initially, fry move downstream into back- or edge-water areas of lower velocities and adequate cover and food. As juveniles grow larger, they move into deeper and faster water (Moyle 2002, cited in R2 Resource Consultants).

4.6.3 Decline of Salmon and Steelhead Fisheries in the Project Area

Salmonid fisheries in the Russian River watershed have experienced substantial declines over the last 100 years. The most notable decline in the numbers of

[22] The term "iteroparous" refers to species that reproduce repeatedly during their lifetime.

[23] The term "alevins" refers to the developmental life stage of young salmonids between the egg and fry stage.

naturally spawning salmon and steelhead occurred since the 1950s (Steiner 1996, SWRCB 1997, cited in R2 Resource Consultants 2007), when extensive development, water use, dam construction and other factors began to impact steelhead and coho production. Populations of natural spawning coastal coho salmon are significantly lower than they were in the 1960s, a result of habitat loss, hatchery construction, and harvest (Brown et al. 1994, cited in R2 Resource Consultants 2007). Important flow-related causes of decline are summarized below.

The two largest dams in the Russian River watershed, Coyote Valley and Warm Springs, were completed in 1959 on the East Fork of the Russian River and in 1982 on Dry Creek, respectively. These dams blocked a major fraction of the available high-quality spawning habitat for steelhead in the basin. Hatcheries were constructed as mitigation, resulting initially in the introduction of Chinook, coho, and steelhead from other regions. A variety of effects are thought to have occurred in response to hatchery operations, including loss of genetic fitness, introduction of disease, increased juvenile competition, and fishing pressure on adults (Steiner 1996, cited in R2 Resource Consultants 2007). In addition, smaller water supply projects are scattered throughout the watershed.

Flow hydrographs have been altered substantially in the mainstem Russian River and in Dry Creek in response to dam construction and intra-basin diversion from the Eel River to the Russian River. Summer flows are higher than they were historically, and winter peak flows are attenuated (Steiner 1996, cited in R2 Resource Consultants 2007). Increased summer flows in the Russian River mainstem, combined with high summer water temperatures below Cloverdale have contributed to a shift in species composition towards warm water species, both native and introduced. This in turn has led to increased predation and competitive pressures on juvenile salmonids (Steiner 1996, cited in R2 Resource Consultants 2007).

Agricultural and municipal water needs have led to the construction of numerous smaller dams and diversion structures on headwater and downstream tributaries (Steiner 1996, Abbott and Coats 2001, Stillwater Sciences 2002, cited in R2 Resource Consultants 2007). Several low-head structures have also been constructed on the mainstem Russian River. These dams and structures have collectively blocked upstream passage of adult salmon and steelhead, altered the hydrograph including attenuating peaks and reducing summer flows, and interrupted bedload transport. These changes have in turn led to increased summer water temperatures, loss of spawning substrates, riparian vegetation loss or encroachment, and channel incision downstream.

The resulting physical changes have variously impacted spawning and rearing habitat quantity and quality in mainstem and tributary channels. Channel incision has been noted to lead to passage barriers at headcuts and over-steepened locations, particularly in Russian River tributaries. Down-cutting and groundwater pumping have led to lowering of water tables, vertical bank creation, and corresponding impacts to the riparian zone. Tributary habitat has been thought to be

the limiting factor in the Russian River basin. In smaller streams, dams and water diversion have also reduced the availability of upstream passage and spawning flows for anadromous salmonids (Steiner 1996, MTTU 2000, Stillwater Sciences 2002, cited in R2 Resource Consultants 2007).

Frost protection of crops is a beneficial use of water under section 671 of title 23 of the California Code of Regulations (CCR). During a frost event, however, the high instantaneous demand for water for frost protection by numerous vineyardists and other water users may cause reductions in flows in the Russian River stream system that may result in stranding mortality. Stranding increases dramatically when flow drops below a certain water level, defined as the critical flow or stage (Hunter 1992). Matthew J. Deitch, G. Mathias Kondolf, and Adina M. Merenlender (Deitch et al 2009) studied the effects of dispersed, small-scale water projects on streamflow and aquatic ecosystems in the northern California wine country and published the results in a paper titled, "Hydrologic Impacts of Small-Scale Instream Diversions for Frost and Heat Protection in the California Wine Country." Deitch et al. concluded that small instream diversions during frost events deplete streamflow over short durations. The report also indicates that small instream diversions on other tributaries in the Russian River watershed may have similar effects, and that the cumulative changes that small water diversions cause to the natural flow regime may play a principal role in limiting valued ecological resources such as anadromous salmonids.

Stranding is the separation of fish from flowing surface water. Stranding occurs when water levels quickly drop and fish are stranded on de-watered river banks and isolated shores. (USFWS 2006) It can occur at any drop in stage, and is not always associated with significant or complete dewatering of a river. Salmonids respire using their gills and do not survive out of water for more than ten minutes, therefore stranding is always fatal (Hunter 1992). Entrapments, another form of stranding, can occur when flows drop and isolated pools of water are created, trapping fish in shallow water where they can be easy targets for predators or suffer from the effects of temperature shock, and/or oxygen depletion. (Hunter 1992). Stranding can occur as a result of natural declines in flow, municipal water withdrawals, and agricultural withdrawals.

Salmonid vulnerability to stranding is related to fish size. Therefore, fry emergence and juvenile rearing and timing of flow fluctuations can influence the severity of stranding impacts to any one species (USFWS). Juveniles who have recently emerged from the gravel are the most vulnerable. They are poor swimmers and occupy the most shallow areas of a river or stream. Many juveniles prefer to inhabit shoreline areas, and side channels because of the reduced flows. In addition, areas at the margin of a stream are attractive to juveniles because greater aquatic invertebrate populations reside along waters edge in stable flow conditions. For these reasons, the large cumulative rate of diversion for frost protection purposes from March 15 through May 15 can contribute to stranding of juvenile salmonids.

Other physical habitat and water quality changes have occurred largely due to various forms of rural and urban development and land use in the Russian River watershed. The changes have particularly impacted summer rearing habitat for anadromous salmonid juveniles, in the form of reduced pool habitat area, reduced riparian habitat, increased water temperatures, decreased dissolved oxygen levels due to fertilizer and sewage discharge, and increased point and non-point pollution.

Most coastal rivers and streams north of the Russian River have been impacted more by timber harvest activities than by water use. In general, there is a gradual shift in impacts from timber harvest towards water diversion and grazing with decreasing latitude. Timber harvest-related impacts to salmonids in the more northern subbasins have occurred in the form of increased sedimentation of spawning habitat through road and landslide inputs, and loss of large wood and concomitant habitat complexity. Impacts from grazing in the more southern subbasins have similarly included sedimentation, loss of riparian habitat, and channel incision (Kelley 1976, Mendocino County 1984, MCRCD 1992, State Water Board 1998a, Entrix et al. 1998, CDFG 2001, cited in R2 Resource Consultants 2007).

4.7 Special-Status Species and Sensitive Communities

The project area supports a rich diversity of special-status species and other sensitive biological features and communities, including species and communities associated with streams and rivers subject to the regulation. Special-status species refer to plant and animal species that are listed or under consideration for listing under the federal and state endangered species acts, as well as species accorded special protection under the Fish and Game Code or described as “species of special concern” by CDFG, and species and communities listed by the California Native Plant Society. Special-status plants that occur in riparian, freshwater marsh, and vegetated lacustrine habitats are listed in appendix B to this document. Special-status animals that occur in these habitats are listed in appendix C.

4.8 Land Use and Planning

Land uses in the project area consist of a diverse mix of natural resource lands, agricultural, rural residential, and urban uses (figure 4-6). Natural resource areas within the area include lands used for timber production, agriculture, recreation, open space, and habitat protection. The hilly and mountainous topography, multitude of ridges and valleys, coastal terraces and tidal flats, and the rivers and streams of the area were all important factors in the patterns of human settlement, development, and land use in the area. The area as a whole is not heavily populated, particularly in the coastal and interior mountainous areas; however, the number of developed communities and the population densities, or people per square mile, increase toward the Santa Rosa Plain and along the Russian River valley portions of the project area. Population centers are more prevalent in the wider valleys. Figure 4-7 shows the population distribution across the project area.

Agricultural production is a major land use and economic force in the project area. While the ranking of particular crops and their gross total values vary from year to year, major agricultural commodities in the area include wine grapes, timber, cattle, dairy products, and a variety of other crops, such as apples, pears, poultry, strawberries, fish, and field crops. Table 2 shows the top five agricultural crops by county as reported by the counties to the California Farm Bureau.

Table 4-2. Top Five Crops by Value ($ million) in Project Area Counties, 2009

MENDOCINO		SONOMA	
Wine grapes	**$78.5**	**Wine grapes**	**$465.0**
Timber	**$12.3**	**Milk**	**$64.5**
Bartlett pears	**$8.3**	**Poultry**	**$41.0**
Cattle and calves	**$5.8**	**Livestock**	**$26.4**
Milk	**$3.6**	**Woody ornamentals**	**$10.2**

Source: California Farm Bureau website

Insert Figure 4-6

Figure 4-6. Lifeform/Land Cover Map

Insert Figure 4-7

Figure 4-7. Population Density

Water use varies according to crop and type of operation; much of the irrigated farmland is concentrated within the Sonoma valleys and other relatively level areas in the Russian River watershed. Water is required for dairy and cattle operations interspersed throughout the project area. Some agricultural lands are non-irrigated and grazing lands.

The California Department of Conservation produces Important Farmland Maps by county as part of the Farmland Mapping and Monitoring Program. A classification system that combines technical soil ratings and current land use is the basis for the Important Farmland Maps (California Division of Land Resource Protection). Table 4-3 shows Important Farmland Map acreages for Sonoma and Mendocino County.

Table 4-3. Important Farmland[1] Acreage in Mapped Project Area Counties, 2008

	IRRIGATED FARMLAND			NONIRRIGATED	
COUNTY	PRIME	STATEWIDE	UNIQUE	LOCAL	GRAZING LAND
Sonoma	30,815	17,251	32,107	80,045	419,003
Mendocino	21,108	1,365	7,219	None	1,927,016

[1]Source: California Department of Conservation, Division of Land Resource Protection, 2008 "Prime" farmland, "Farmland of Statewide Importance," and "Unique" farmland are categories of Important Farmland. These categories are defined on the Department's website at http://www.conservation.ca.gov/dlrp/fmmp/mccu/Pages/map_categories.aspx.

Major transportation corridors in the project area include Highway 101, which is a major north-south artery in the state; Route 20, which carries traffic from Lake County and points east into Mendocino County, and then continues to the coast; Route 1, which follows the coast either closely or at a distance; Route 12 in Sonoma Valley; Route 116 from Sonoma to the coast; and Route 128 from Napa to the coast. Table 4-4 lists officially designated state scenic highways in the two counties located in the project area; there are no national scenic byways in the project area.

Table 4-4. Officially Designated State Scenic Highways In and Near the Project Area

COUNTY	HIGHWAY/ROUTE	LOCATION	MILEPOSTS
Sonoma	12	From Danielli Avenue east of Santa Rosa to London Way near Aqua Caliente	22.450 – 34.024
Sonoma	116	From State Route 1 to South City Limit Sebastopol	0.0 – 27.817

Source: California Department of Transportation 1999

There are no rivers in the project area listed under the California Wild and Scenic Rivers Act. There are no federally designated wild and scenic rivers located in the project area.

The project area contains 8 parks, beaches, reserves, historic parks, recreation areas, and other properties within the State Park system:

- State Parks: Annadel, Bothe-Napa Valley, Robert Louis Stevenson, Sugarloaf Ridge
- State Beaches: Sonoma Coast
- State Reserves: Atascadero Creek, Armstrong Redwoods State Reserve
- State Recreation Areas: Austin Creek

4.8.1 California Coastal Zone

The project area includes areas located within the state coastal zone. The extent of the zone varies in size throughout the project area. Seaward, the coastal zone extends to the state's outer limit of jurisdiction; inland, it generally extends 1,000 yards from the mean high tide line of the Pacific Ocean. In some significant coastal estuarine, habitat, and recreational areas, the coastal zone extends inland to the first major ridgeline paralleling the sea or 5 miles from the mean high tide line of the sea, whichever is less, and in developed urban areas the zone generally extends inland less than 1,000 yards.

The California Coastal Act[24] was enacted by the State Legislature in 1976 to provide long-term protection for environmental and human-based resources along California's 1,100-mile coastline for the benefit of current and future generations. The Coastal Act made permanent the Coastal Commission, which had been initially established by voters in 1972. In addition to state-wide offices in San Francisco and Sacramento, the Coastal Commission maintains district offices. Mendocino County is part of the North Coast Area; Sonoma County is part of the North Central Coast Area.

Cities and counties within the coastal zone are required to adopt a local coastal program that is consistent with the policies of the Coastal Act. After certification by the Coastal Commission of a local coastal program, coastal development permit authority is delegated to the appropriate local government; however, the Coastal Commission retains permit jurisdiction over certain specified lands, including tidelands and public trust lands. The Commission also has appellate authority over development approved by local governments in specified geographic areas as well as certain other developments.

The policies of the Coastal Act constitute the statutory standards applied to planning and regulatory decisions made by the Commission and by local governments. Coastal policies address a broad range of overlapping issues, including protection of public shoreline access, promotion of coastal recreation and affordable visitor accommodations, protection of environmentally sensitive habitat, conservation of coastal agricultural lands, support for commercial fisheries and coastal-dependent

[24] California Public Resources Code sections 30000 et seq.

industrial uses, water quality, offshore oil and gas development, transportation, power plants, ports, and public works.

4.8.2 Local Land Use

Local agencies in California have primary responsibility for land use control and regulation within their areas of jurisdiction and, to a lesser extent, to areas within their "spheres of influence." State planning and zoning law requires all California counties and incorporated cities to prepare, adopt, and implement a comprehensive general plan to guide the community's growth and development. A general plan is a community's basic vision and "blueprint" for the future, and typically provides policies in many areas pertaining to conservation and development.

Under state planning law, a general plan is required to contain seven elements: land use, open space, transportation/circulation, housing, safety, noise, and conservation. A general plan may also include optional elements at the discretion of the local agency, such as an agricultural element or a recreation element. Water resources and use issues are typically addressed in a general plan in terms of natural resource values as well as an essential requirement for land use and development. Cities within the Coastal Zone may integrate coastal policies into their general plans. The general plan is commonly implemented through zoning and other local land use and development ordinances, which must be consistent with the general plan.

In reviewing and making decisions on applications for various land use entitlements and development projects, the local agency must typically make findings that the proposed activity (e.g., a conditional use permit or a subdivision of real property) is consistent with its general plan. If the decision is discretionary and the project could have an effect on the physical environment, then the county or city is also obligated to comply with the procedural and documentation requirements of CEQA. Among other considerations for analyzing the potential effects of projects on water resources, CEQA contains requirements for agencies to evaluate the potential effects of large projects on public water systems, in coordination with the water agency, to ensure that sufficient water supply is available before approving large subdivisions, commercial office buildings, industrial parks, and similar projects.

5 ALTERNATIVES TO THE PROPOSED REGULATION

The State Water Board solicited alternative proposals for consideration as part of its scoping efforts for the proposed regulation. CEQA requires that a lead agency analyze a reasonable range of alternative methods of achieving the goals of a project.

The State Water Board's objective for the project is to establish a regulation that will prevent salmonid stranding mortality while minimizing the impacts of the regulation on the use of water for purposes of frost protection. In support of this objective, the State Water Board's goals are to (a) promote local development and governance of programs that prevent stranding mortality during the frost season, (b) provide transparency of diversion and stream stage monitoring data, (c) ensure that the State Water Board can require any changes to WDMP's that are necessary to ensure that WDMP's are successful and implemented on a timely basis, (d) provide for State Water Board enforcement against non-compliance, and (e) develop a comprehensive regulation that includes all diverters of water for frost protection use, including diverters who pump groundwater that is hydraulically connected to the stream system.

As described in section 3, the proposed regulation establishes that, with the exception of diversions upstream of Warm Springs Dam in Sonoma County or Coyote Dam in Mendocino County, any diversion of water from the Russian River stream system, including the pumping of hydraulically connected groundwater, for purposes of frost protection from March 15 through May 15, shall be diverted in accordance with a board-approved water demand management program. The diversion of water in violation of the proposed regulation would be an unreasonable method of diversion and use and a violation of Water Code section 100. ~~diversions from the Russian River stream system for purposes of frost protection from March 15 through May 15, are unreasonable unless they are in accordance with a Water Demand Management Program (WDMP) approved by the State Water Board. The proposed regulation would apply to all diversions, including hydraulically connected groundwater regardless of the diverter's basis of right, unless a diversion is upstream of Warm Springs Dam in Sonoma County or Coyote Dam in Mendocino County. In order to be approved, a~~A WDMP would be required to ensure that cumulative diversions for frost protection do not result in a reduction in stream stage that causes salmonid stranding mortality and would be required to include: (1) an inventory of the frost diversion systems within the area subject to the WDMP, (2) a stream stage monitoring program, (3) an assessment of the potential risk of stranding mortality due to frost diversions, (4) the identification and implementation of corrective actions necessary to prevent stranding mortality, and (5) annual reporting of program data, activities, and results. The number and location of stream stage monitoring gages would be required to be established in consultation with the NOAA Fisheries Service and the California Department of Fish and Game. The

WDMP would be required to be administered by a governing body capable of ensuring the goals of the program are met. If stream stage monitoring shows cumulative diversions may have potential to result in salmonid stranding mortality, the governing body would work with the diverters to develop corrective actions.

This section describes other alternatives considered by the State Water Board. For the purposes of this assessment, alternatives to the proposed regulation include the No Project Alternative (Alternative 1), local stakeholder voluntary programs (Alternative 2), adoption of a regulation similar to the Sonoma County Vineyard and Orchard Frost Protection Ordinance (Alternative 3), adoption of a regulation similar to one previously adopted for the Napa River watershed (California Code of Regulations, title 23, section 735) (Alternative 4), and adoption of a regulation similar to the proposed regulation, except that real-time monitoring and reporting of diversions also would be required (Alternative 5). These alternatives are discussed in sections 5.1 through 5.5, below. The anticipated environmental impacts that may occur as a result of actions taken in response to the regulation alternatives, and the extent to which the alternatives are anticipated to achieve the project objective and goals, are analyzed in Section 6.

5.1 No-Project Alternative – Alternative 1

Under the No-Project Alternative, the State Water Board would not adopt a regulation in order to protect anadromous salmonids from stranding mortality due to diversion of water for purposes of frost protection. Instead, the State Water Board would continue to administer the water right program in accordance with its current practices and statutory requirements and take enforcement action on a case-by-case basis.

Although by its terms article X, section 2 of the California Constitution is self-executing, under the no project alternative, diverters would be unlikely to curtail their diversions to prevent cumulative diversions for frost protection from causing a reduction in stream stage that causes stranding mortality ~~address the cumulative impacts of their diversions~~ unless the Board takes steps to enforce the reasonable use doctrine or takes some other sort of enforcement action against them. The State Water Board has authority to prevent waste or unreasonable use or unreasonable method of use of all water resources of the State, including groundwater. In addition, water right permits contain standard permit terms stating that all rights and privileges, including method of diversion, method of use, and quantity of water diverted, are subject to the continuing authority of the State Water Board in accordance with law and in the interest of the public welfare to protect public trust uses and to prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion (Article X, section 2 of the California Constitution). Under the no project alternative, the State Water Board could address diversions either individually or in groups. However, the State Water Board would have no information to identify who diverted water for frost protection during the year and whether any diversion contributed to stranding mortalities.

5.2 Local Stakeholder Voluntary Programs – Alternative 2

As an alternative to taking regulatory action, the State Water Board could support the development of local stakeholder programs that would reduce the direct diversion of surface water for the purposes of frost protection. The Board could encourage diverters to participate in a local program and develop guidelines for diverters who choose not to participate in the local program.

In response to observed mortalities of listed salmonids associated with frost protection irrigation, NMFS established a Frost Protection Task Force (FPTF) in July 2008. The mission of the FPTF was to develop a collaborative forum with multiple stakeholder interests to address this threat. On February 19, 2009, NMFS asked the State Water Board to take immediate action, such as implementing emergency regulations, to protect against salmonid mortality caused by stranding during frost events. At a public workshop on April 7, 2009, the State Water Board asked NMFS to continue to work with stakeholders to develop local stakeholder voluntary programs that would be non-regulatory in nature. NMFS identified Standards for Success for the voluntary programs, which included: (a) adequate conservation actions, i.e., understanding of water budgets, including water needs of fishery resources, (b) management of frost diversions so as to not undermine conservation efforts, (c) full participation of diverters, (d) monitoring and reporting on compliance, (e) adequate monitoring of streamflow and water use, and (f) transparency of data and information with public agencies (NMFS 2009b). In September 2009, NMFS received proposals from the Upper Russian River Stewardship Alliance (URSA) in Mendocino County and the Frost Protection Resources Group in Sonoma County, which was a precursor to the Middle Russian River Stewardship Alliance (MRSA). In late October 2009, NMFS received a proposal from the Russian River Property Owners Association (RRPOA).

The following paragraphs describe the local stakeholder approaches that were received.

Russian River Frost Program

The Russian River Frost Program (RRFP) was submitted to the State Water Board on November 10, 2009, and the program appears to be a combination of the frost protection efforts of the Middle Russian River Stewardship Alliance (MRSA) and the Upper Russian River Stewardship Alliance (URSA).

The principal goal of the RRFP is to reduce any acute effects on stream flow from direct diversions during frost periods through two means: reducing the demand for water for frost protection (e.g., beneficial management practices) and changing the manner of diversion (e.g., shift from direct diversion from streams to diversion by well or to offstream storage). The Program would be managed by two governing bodies; one would oversee MRSA and the other URSA. An independent Science Advisory Group (SAG) would direct monitoring efforts and provide advice to the

governing bodies on what factors to investigate and monitor. The SAG's primary responsibilities would be to articulate conceptual models of stream flow processes; review the existing evidence and research, identify data gaps, and recommend methodology to resolve data gaps; recommend necessary monitoring to provide a basis for determining changes in water management to assure adequate instream flow; review watershed analysis; and review annual reports. Landowner participation in the program is voluntary and would be measured in terms of the participation necessary to resolve identified problems.

The goals of the RRFP would be accomplished through four main components: outreach, watershed assessment, conservation actions, and program coordination and analysis. The governing body would outreach to farmers that divert water for frost protection and educate them about the Program. There would also be stakeholder meetings and annual program updates before and after the frost season. The watershed assessment component would focus on the subwatersheds identified as at risk by the resource agencies. It would include collecting land use information, consultation with the SAG to determine priorities for locations and types of monitoring and conservation actions, and monitoring of stream flow using existing gages or installing new ones where necessary. The goal of the conservation component is to reduce the potential for conflict between diversions for frost protection and fishery resources. This would be accomplished by reducing the instantaneous diversion rates through implementing, where appropriate, frost protection beneficial management practices, infrastructure improvements, diversion coordination, and improving the quality and access to frost forecasting. The program coordination and analysis component would consist of annual frost program reporting, agency coordination, and adaptive management.

URSA and MRSA have the same overall program goals and structure, but the specific conservation actions, monitoring, and reporting elements are different. The RRFP states this structure would allow implementation plans to be tailored to local conditions. URSA would focus on mainstem issues that are the primary concern in the upper part of the watershed. MRSA would focus on tributary issues that are the primary concern in the middle watershed. The most significant differences are in the monitoring and reporting programs.

URSA plans to maintain stream stage levels that are protective of salmonids in the mainstem through conservation actions and monitoring of existing stream gages to coordinate pulse flows from Coyote Dam. In the tributaries they will initially conduct a study on two reference streams to establish natural diurnal flow patterns. Once the study is complete and the data is analyzed they will select three basins with frost diversions to monitor and study the effects of frost diversions on stage levels. Their future water management actions will be based on the results of these two studies. URSA will develop an annual summary report of the Program's findings and actions.

MRSA plans to focus monitoring efforts on the tributaries and does not include a monitoring plan for the mainstem. The tributary monitoring plan includes a study of

two reference streams, a tributary frost protection assessment, and effectiveness monitoring. The frost protection assessment provides an estimate of the peak surface water direct diversion demand for frost protection on each major tributary and identifies strategies for reducing instantaneous demand. The effectiveness monitoring analyzes the effects of direct water diversion on flow, how other diversions affect flow during frost season, and whether conservation actions are addressing affects. Initial monitoring efforts would be focused on two reference streams and in Maacama, Mark West, and Green Valley watersheds. MRSA will develop an annual report of the Program's findings and actions that includes flow data for tributaries; frost diversion reporting; and participant's name, acres, source of water, quantity diverted for frost protection, and date and time of diversions.

Monitoring for URSA involves two years of research on two reference tributaries, with minimal diversions, before any frost diversion monitoring will occur and then it will only occur on three selected watersheds. MRSA has a stronger monitoring program that focuses on only three watersheds. Both of these monitoring plans are not applied over the entire area where there is potential for diversions for frost protection to cause mortality to salmonids. The URSA program has limited transparency of data and information with public agencies. The MRSA program has better transparency, but excludes a collaborative process with public agencies.

Russian River Property Owners Association

The Russian River Property Owners Association (RRPOA) is comprised of 100 landowners along the Alexander Valley reach of the Russian River in Sonoma County. The RRPOA proposal involves a self-governing body which would implement an adaptive management plan. The proposal includes a plan for assessing the effects of well withdrawals for frost protection on groundwater and streamflow in the Russian River and its tributaries. The proposal would involve implementation of best management practices for water conservation and water demand; and would involve extensive collaboration with NMFS and other public agencies in the development of monitoring locations and future monitoring efforts. Similar to the URSA and MRSA, the RRPOA is a voluntary program. The RRPOA appears to be the only proposal that relates water management plans or conservation goals to salmonid habitat requirements.

5.3 Adopt a Regulation Similar to the Sonoma County Vineyard and Orchard Frost Protection Ordinance – Alternative 3

Under this alternative, the State Water Board would consider adopting a regulation similar to the Sonoma County Vineyard and Orchard Frost Protection Ordinance (Chapter 11B of the Sonoma County Code of Ordinances) that was adopted by the Sonoma County Board of Supervisors on December 14, 2010. The ordinance establishes a registration program and requires all owners of vineyard and orchard frost protection systems in the Russian River watershed within Sonoma County to participate in a comprehensive monitoring program. The ordinance requires all frost

water protection users to annually register with the agricultural commissioner. Each application for registration must be received on or before March 1 and include all required fees, and any information, materials, and submittals required by the agricultural commissioner. Vineyards and orchards that file an application are subject to inspection by the agricultural commissioner to verify the submitted information. The ordinance requires the agricultural commissioner to develop a monitoring program in consultation with NMFS, DFG, the State Water Board, Sonoma County, and University of California Cooperative Extension. The agricultural commissioner may contract with a qualified nonprofit organization or local agency to implement the program. Where a stream gage or other equipment for the program is placed on a site, the property owner must provide adequate access to the agricultural commissioner to collect data and maintain the equipment.

The State Water Board received a draft of the Sonoma County, Russian River Stream System Frost Monitoring Program Scoping Document (Scoping Document), on December 3, 2010. The Scoping Document provides some insight on how the registration and monitoring program may be implemented. The following three paragraphs summarize this document. The program details described below are not final and are subject to change.

The registration survey would collect information on the user's frost system infrastructure and water diversions including: sprinkler type(s), acres protected, gallons per acre per minute, water source(s), point(s) of diversion, diversion rate, well distance from nearest blue line stream, well depth, well seal depth, storage capacity, storage recharge rate, recharge source(s), and maximum gallons per minute at 100% frost protection.

The monitoring period would be defined as March 15th to June 15th. Stream stage would be monitored by a combination of real-time stream gages and conventional data loggers that would be downloaded manually. All gages would collect and record data at 15 minute intervals or less. The Scoping Document estimated there would be one to five stream stage monitoring gages installed per stream, which would be placed in consultation with NOAA Fisheries, Department of Fish and Game, and the State Water Board. Diverters would monitor and record diversion capacities, actual timing, and rate of diversion throughout the frost season.

The monitoring and reporting program would be conducted by an Independent Science Review Panel (ISRP), which would consist of a multi-disciplinary group of independent scientists. The ISRP would provide technical guidance to the County, grower group, and resource agencies on the stream flow monitoring study design and provide interpretation of stream flow monitoring data relative to an assessment of hydrologic impacts from frost protection activities on salmonids. The ISRP would actively identify any problem areas that might occur and work with the identified property owner to mitigate a potentially harmful use of water for frost protection. At the end of each frost season, the ISRP would analyze the corrected stream and

diversion data and compile a report, which would be peer reviewed by the resources agencies prior to public release.

5.4 Adopt a Regulation Similar to California Code of Regulations, Title 23, Section 735 – Alternative 4

As an alternative to the proposed regulation, the State Water Board could adopt a regulation similar to the previously adopted regulation regarding diversions for frost protection use in the Napa River watershed.
Under California Code of Regulations, title 23, section 735, all diversions of water from the Napa River stream system between March 15 and May 15 determined to be significant by the State Water Board or a court of competent jurisdiction shall be considered unreasonable and a violation of Water Code Section 100 unless controlled by a watermaster administering a Board or court approved distribution program. Diversions for frost protection and irrigation during this period are restricted to: (1) replenishment of reservoirs filled prior to March 15 under an appropriative water right permit, or (2) diversions permitted by the court.

At a State Water Board workshop on April 7, 2009, Kevin Taylor, Department of Water Resources; and Drew Aspegren, Napa Valley Vineyard Engineering, gave a presentation regarding the Napa Watermaster perspective and experience. They stated that the Napa River regulation has been a successful example of changes to diversion practices in which diverters are required to move to offstream storage and coordinate diversions for frost protection use in order to reduce instantaneous demand on the stream system.

A regulation similar to this approach, applied to the Russian River watershed, could be considered. However, a regulation providing for one corrective action (convert to offstream storage and secure a water right permit from the State Water Board) would impose the highest potential costs to frost diversions to comply.

5.5 Adopt a Regulation That Requires Real-Time Diversion Monitoring and Reporting – Alternative 5

This alternative would entail adoption of a regulation that is the same as the proposed regulation, except that the regulation under this alternative also would require real-time monitoring and reporting of frost diversions. As with the proposed regulation, water users would be encouraged to divert in accordance with a WDMP by establishing that diversions for frost protection are unreasonable unless they are in accordance with a Water Demand Management Program (WDMP) that has been approved by the State Water Board. It also is similar to the proposed regulation in that any WDMP must ensure that the cumulative diversion rate for frost protection of the participants in the WDMP will not result in a reduction in stream stage that causes salmonid stranding mortality. It would also require the WDMP to establish minimum stage level requirements at specified gage locations, with recording of stream stage data at intervals not to exceed 15 minutes.

However, this alternative would also require real-time monitoring and reporting of frost diversions. This would be a mandatory requirement unless the diversion qualified for an exemption. It would require the rate and volume of a diversion to be based on metered data if the diversion is otherwise required to be metered pursuant to the Water Code, the State Water Board's regulations, or a term or condition of the diverter's permit or license. If a diversion is not otherwise legally required to be metered, this alternative would allow the rate and volume of the diversion to be calculated based on the time period during which water is diverted, acreage frost protected, and a reasonable estimate of the frost system capacity at the time of the diversion. Diverters would be required to report diversion monitoring data, including diversion to ponds for direct use or recharge, to the governing body on an hourly basis. This alternative would require the governing body to post the diversion data within 36 hours of the initiation of a frost event on a public internet site. Stream stage data would also be required to be posted, using a continuous graph of 15-minute data records.

6 ASSESSMENT OF ENVIRONMENTAL IMPACTS

6.1 Approach to This Assessment

The State Water Board has prepared this environmental impact report to assess the potential environmental effects of adopting and implementing the proposed regulation which provides that, with the exception of diversions upstream of Warm Springs Dam in Sonoma County or Coyote Dam in Mendocino County, any diversion of water from the Russian River stream system, including the pumping of hydraulically connected groundwater, for purposes of frost protection from March 15 through May 15, shall be diverted in accordance with a board-approved water demand management program. The diversion of water in violation of the proposed regulation would be an unreasonable method of diversion and use and a violation of Water Code section 100. ~~that the diversion of surface water or hydraulically connected groundwater from the Russian River watershed from March 15 through May 15 for frost protection is unreasonable unless conducted in accordance with an approved water demand management program.~~ The regulation itself will not approve any actions that may be proposed in response to the regulation, such as the implementation of alternative frost protection methods, or modifications to current water diversion facilities. Moreover, it is impossible to predict what actions specific diverters will take in response to the proposed regulation. Thus, the assessment of the proposed regulation's potential environmental impacts is necessarily conducted at a programmatic level.

Specific actions that may be undertaken in response to the proposed regulation will be assessed on a project-level basis under CEQA if the actions will be carried out or approved by a public agency, and the actions are not exempt from CEQA requirements. Many of the potential significant environmental impacts identified herein will be subject to further analysis under CEQA when actions are taken in response to the regulation, if those projects are subject to a discretionary process. If future project-level environmental reviews identify significant environmental effects, the lead agency must either mitigate those effects to less-than-significant levels or adopt a statement of overriding considerations that provides reasons for approving the project despite the potential for significant environmental impacts.

In general, the regulation will operate to protect the environment by ensuring that water diversions for the purposes of frost protection are coordinated in a manner that the instantaneous cumulative diversion rate does not result in a reduction of stream stage that causes salmonid stranding mortality. Adoption and implementation of the regulation, however, will have direct and indirect incidental environmental effects. A direct environmental impact occurs as a result of a direct physical change in the environment which is caused by the adoption of regulation. An indirect environmental impact occurs as a result of an indirect physical change in the environment, which is a reasonably foreseeable physical change that is not

immediately related to adoption of the regulation, but which may occur as a result of the regulation being adopted and implemented.

For instance, the regulation may result in increased construction of offstream seasonal storage water supply reservoirs. Development of these reservoirs may result in environmental impacts, such as construction-related impacts, impacts due to the inundation of land under the reservoir, and operational impacts that result from the diversion of water from the stream. To the extent that those impacts can be anticipated, they are disclosed in this document. Similarly, those who wish to frost protect but do not desire to or cannot comply with the proposed regulation may seek alternative methods of frost protection that do not use water, such as combined use of wind machines and orchard heaters. These actions can result in environmental changes that are indirect effects of regulation adoption. To the extent those effects can be anticipated and disclosed, the State Water Board has done so.

6.1.1 Actions That May Be Taken by Affected Persons

The proposed regulation contains provisions that may lead affected persons to take actions that could result in indirect environmental impacts. Adoption of the regulation can result in two types of indirect impacts to the environment: (1) impacts that may occur as a result of complying with the regulation, and (2) impacts that may occur as a result of attempting to avoid the need to comply with the proposed regulation.

For example, a diverter who uses water for frost protection could choose to continue using water to frost protect and install wind machines to reduce the overall amount of water needed for frost protection. Another diverter may choose to discontinue using water altogether and switch to wind machines in combination with orchard heaters to protect crops from frost. In both examples, the affected persons could choose to take actions that would result in the installation of wind machines, but the person who continues to divert water for purposes of frost protection would be subject to the regulation, whereas the person who ceases to use water altogether would not.

The actions that affected persons may take to comply with the regulation include:

- Installing hydraulically connected groundwater extraction wells and increasing hydraulically connected groundwater use,
- constructing new and expanding existing offstream storage facilities and increased diversion of water to storage,
- removal or alteration of existing surface water diversion facilities,
- installing and operating wind machines,
- installing and operating orchard heaters,
- installing stream stage gages,
- installing and operating diversion monitoring devices,
- installing and operating low flow emitters, and
- any combination of above actions.

The actions that affected persons may take in order to avoid the regulation include actions that result in discontinued use of surface water or hydraulically connected groundwater:

- removal or alteration of existing surface water diversion facilities,
- installing non-interconnected groundwater extraction wells and increasing non-hydraulically connected groundwater use,
- installing and operating wind machines with no reliance on water diversion,
- installing and operating orchard heaters with no reliance on water diversion, and
- any combination of above actions

It is impossible to predict which affected parties will take any of the actions described above, or exactly how many affected parties will take any of those actions. Accordingly, the environmental impacts were evaluated at a programmatic level. A programmatic level analysis is more general in nature and evaluates the effects on the environment on a broad level. Given this level of analysis, a conservative approach was taken to ensure potential environmental impacts were fully analyzed. Estimates of how many affected parties will take any of the described actions were conservative in nature, and include high and low estimates of the magnitude of the potential actions that could be taken in response to the proposed regulation. In addition, if any reasonably foreseeable outcome of implementing the proposed regulation for any one project could conceivably have a significant effect on an environmental resource, that effect was judged to be significant in all cases.

6.1.2 Vineyard and Orchard Acreage That May Be Affected by Potential Actions Taken in Response to the Proposed Regulation

The proposed regulation would affect vineyard and orchard acreage that is frost protected with surface water or hydraulically connected groundwater within the Russian River watershed, excluding the acreage in the watersheds upstream of Warm Springs Dam in Sonoma County and Coyote Dam in Mendocino County. Individual vineyards and orchards can vary substantially in acreage, and the magnitude of the need for frost protection is related to the acreage that would need frost protection rather than the number of vineyards involved. To determine the potential magnitude of the environmental impacts associated with implementation of the proposed regulation, a range of affected acreage was estimated. The affected acreage represents the number of vineyard and orchard acres that may be affected by actions taken in response to the proposed regulation.

The lower range of affected acreage represents the vineyard and orchard acreage most likely to be affected by the proposed regulation. This was obtained by estimating the vineyard and orchard acreage upstream of potential stranding sites for salmonids identified by NMFS and subtracting acreage already being frost

protected with water from offstream storage reservoirs and acreage protected with methods that do not require water. The vineyard and orchard acreage upstream of potential stranding sites was determined using the NMFS' GIS layer "Potential Stranding Sites" and the SWRCB Water33.sde "USA Prime Imagery" layer, as described in appendix D (Economic and Fiscal Impacts of the Proposed Russian River Frost Regulation). Table 4-5 of appendix D used estimates of the measured crop acreages and areas protected by existing frost protection methods to determine the potential acreage for which alternative frost protection methods may be implemented in response to the regulation. Table 6-1, Method Used to Estimate Lower Range of Vineyard and Orchard Acreage That May Be Affected By Actions Taken in Response to the Proposed Regulation, provides a summary of table 4-5 of appendix D.

Table 6-1. Method Used to Estimate Lower Range of Vineyard and Orchard Acreage That May Be Affected By Actions Taken in Response to the Proposed Regulation

	MENDOCINO	SONOMA	TOTAL
Acreage Posing Potential Risk of Stranding Mortality	2,227	11,526	13,753
Acreage Currently Frost Protected by Water From Existing Offstream Storage Reservoirs	1,417	10,117	11,534
Acreage Currently Frost Protected by Wind Machines	0	1,550	1,550
Acreage Currently Frost Protected by Other Methods	0	176	176
Acreage Currently Not Needing Frost Protection Measures	0	3,457	3,457
Lower Range of Affected Acreage for which Alternative Frost Protection Methods May Be Implemented in Response to the Proposed Regulation	1,020	2,763	3,783

The upper range of affected acreage includes all vineyard and orchard acreage known or likely to use water for frost protection in the project area. Table 1 of the "Irrigated Agriculture Water Needs and Management in the Mendocino County Portion of the Russian River Watershed" by the University of California Cooperative Extension (UCCE) Mendocino County (July 2008) estimated the frost protected acres for Mendocino County to be 5650 acres. The report noted that this acreage only accounts for the areas that were frost protected for radiant frost events, and that infrequent advective frost events would impact the entire portion of the Russian River watershed located in Mendocino County, regardless of elevation.

Since there is potential, during an advective frost, for all orchards and vineyard owners in Mendocino County to use water for frost protection, the total vineyard and orchard acreage of 15,500 acres (UCCE Mendocino County, 2008) in the

Mendocino County portion of the project area was used in this analysis to represent a conservative estimate for the upper range of affected acreage in Mendocino County.

The upper range of affected acreage in Sonoma County was estimated as follows. The "Sonoma County Vineyard" GIS layer created by UC Berkeley, IHRMP North Coast GIS Lab (December 2009) was used to estimate the total vineyard acres in the Sonoma County portion of the project area at 46,030 acres. A summary report of a study conducted by the Sonoma County Farm Bureau reported that 30 percent of the vineyard acreage surveyed in the study did not frost protect ("Current Vineyard Survey Totals", 2010, submitted to the Board by Pete Opatz on February 26, 2010). This percentage (30%) was applied to the total vineyard acres in Sonoma County to obtain a conservative estimate of the upper range of affected acreage. Using this approach, the upper range of affected acreage for the Sonoma County portion of the project area was estimated to be 32,225 acres.

The upper range of affected acreage estimated for both counties is a conservative estimate because it does not take into account the extent to which existing frost protection practices may not need to change as a result of the proposed regulation. For example, acreage that is currently frost protected using only wind machines would be unaffected by the regulation. In addition, it may be possible for many surface and groundwater diverters to continue their current diversion practices in accordance with an approved water demand management program. Table 6-2 summarizes the affected acreage that will be used in this analysis.

Table 6-2. Summary of Vineyard and Orchard Acreage That May Be Affected by Actions Taken in Response to the Proposed Regulation

	Range of Affected Acreage	
	Lower Range	**Upper Range**
Mendocino County	**1,020**	**15,500**
Sonoma County	**2,763**	**32,225**
Total Project Area	**3,783**	**47,725**

6.2 Effects of Increased Groundwater Extraction and Use

6.2.1 How Implementation of the Proposed Regulation May Give Rise to This Result

The proposed regulation's requirement that diversions of water for frost protection use be conducted in accordance with an approved water demand management program could lead some affected persons to obtain some or all of the water needed for frost protection use from groundwater extraction. A water right permit would be

required in order to divert groundwater from a subterranean stream flowing through known and definite channels.

Groundwater pumping can contribute to a cumulative reduction in stream stage during a frost event if streams and adjacent alluvial aquifers are hydraulically connected. Extraction of hydraulically connected groundwater has a potential effect on surface water stage levels, but the influence of cumulative diversion for frost protection may be spread out over a greater period of time, resulting in less instantaneous effects on stage. Accordingly, it is possible that a corrective action plan developed in accordance with an approved water demand management program will call for some surface water diverters to switch to groundwater pumping in order to reduce instantaneous effects on stream stage during frost events.

Non-interconnected groundwater is water extracted from an aquifer that is hydraulically disconnected from the natural channel or subterranean stream. The pumping of non-interconnected groundwater is an action that affected persons may take to avoid the regulation because it would not involve diversion of surface water or hydraulically connect groundwater that affects surface water flow. For purposes of the proposed regulation, all groundwater within the Russian River watershed would be considered hydraulically connected unless diverters can demonstrate to the State Water Board's satisfaction that they are diverting groundwater that is not hydraulically connected to any surface stream within the watershed.

The potential environmental impacts of pumping of non-interconnected groundwater are discussed in this analysis because of its potential effect on groundwater supplies. For purposes of this analysis, both hydraulically connected groundwater and non-interconnected groundwater are referred to as groundwater.

6.2.2 Issues and Potential Effects

Groundwater basins within the affected geographic area are shown in figure 4-2, as defined in California Department of Water Resources Bulletin 118 (DWR 2003). Other groundwater resources are present, but these regions have not been defined as basins by DWR and the extent and reliability of any such supplies are uncertain.

A range of potential future demands for groundwater was estimated in order to fully evaluate the potential environmental effects of changing sources of water for frost protection from surface water to groundwater extraction. The lower end of the range was obtained by assuming groundwater extraction would be used to frost protect the entire lower range of affected acreage listed in table 6-2. Likewise, the upper end of the range was obtained by assuming groundwater extraction would be used to frost protect the entire upper range of affected acreage. For Mendocino County the future demand in total acre feet per year for the lower and upper ranges was calculated using the frost protection water estimates shown in table 3-6, and application rates described in section 3.2, of appendix D. The application rate for grapes was assumed to be 50 gallons/minute/acre, and for pears, one acre-inch was assumed to be applied for each frost protection event. The analysis assumes the average

annual amount of water applied for frost protection for the watersheds in Mendocino County is 0.40 acre-ft per acre per year. For Sonoma County the future demand was estimated to be equivalent to the water estimate for wine grapes in Hopland shown in table 3-6 of appendix D. The analysis assumes the average annual amount of water applied for frost protection for the watershed in Sonoma County is 0.28 acre-ft per acre per year.

Estimates of the range of future water supply demands for frost protection use are provided in table 6-3. The estimated range of potential groundwater demand and adequacy of existing groundwater supplies is provided in table 6-4.

Table 6-3. Range of Water Supply Needed to Frost Protect Affected Acreage in the Project Area

	Mendocino County		**Sonoma County**		**Total Project Area**	
	Lower	**Upper**	**Lower**	**Upper**	**Lower**	**Upper**
Range of Affected acreage	**1,020**	**15,500**	**2,763**	**32,225**	**3,783**	**47,725**
Water Supply Needed for Frost Protection (af/ac/yr)	**0.40[1]**	**0.40**	**0.28[2]**	**0.28**	**-----**	**-----**
Total Water Supply Needed for Frost Protection (af/yr)	**410**	**6,200**	**775**	**9,025**	**1,185**	**15,225**

[1]Table 3-6, Appendix D

[2]Value for Sonoma County was assumed to be equivalent to Hopland water requirements

Table 6-4. Estimated Potential Future Groundwater Demands in the Project Area

County	Groundwater Basins	Future Groundwater Demands (AF/year)		Adequacy (see note below)*
		Lower Range	Upper Range	
Mendocino	McDowell Valley, Sanel Valley, Ukiah Valley	410	6200	Likely adequate to meet lower demand. May be adequate to meet upper demand for small agencies and self-supplied individuals provided site-specific hydrogeologic conditions are suitable.
Sonoma	Alexander Valley, Knights Valley, Lower Russian River Valley, Santa Rosa Valley, Wilson Grove Formation Highlands	775	9,025	Likely adequate to meet lower demand. May be adequate to meet upper demand for small agencies and self-supplied individuals provided site-specific hydrogeologic conditions are suitable.

* The availability of groundwater that is not subject to the water right permitting authority of the State Water Board is unknown and subject to the determinations of the State Water Board. The adequacy of groundwater as an alternative supply source may be limited by future State Water Board determinations.

The use of groundwater in the affected geographic area is limited by hydrogeologic factors, including thin alluvial deposits, aquifer materials of low permeability, and the quality of water. Overdraft, resulting from excessive pumping associated with development, could possibly occur in the future, reducing available supplies in late summer and dry years. In some site-specific cases, groundwater may be an adequate alternative supply source for self-supplied individuals for agricultural use.

Possible impacts that might result from increases in groundwater extraction are discussed in table 6-5, Possible Indirect Environmental Impacts Resulting from Increased Groundwater Extraction and Use by Water Diverters in Response to the proposed regulation.

Table 6-5. Possible Indirect Environmental Impacts Resulting from Increased Groundwater Extraction and Use in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Aesthetics	Construction activities could result in short-term disturbance of visual resources. Siting of infrastructure could result in long-term disturbance of visual resources.	Potentially significant depending on the characteristics of the specific action taken.
Agriculture Resources	Increases in groundwater extraction could result in lowering of the groundwater table and reduction in water available to non-irrigated crops that rely on groundwater for soil moisture resulting in reduced crop yield.	Potentially significant depending on the characteristics of the specific action taken.
Air Quality	Construction activities could result in short-term contribution to PM10, ozone, nitrogen oxides, carbon monoxide or other pollutant levels. Operation of some pumps could result in long-term increased pollutant levels. Reliance on alternative methods of diversion or alternative water supplies could result in long term operation of pumps, which could result in increased greenhouse gas emissions (primarily carbon dioxide, methane, nitrous oxide, and ozone) that may contribute to global climate change.	Potentially significant depending on the characteristics of the specific action taken.

Table 6-5. Possible Indirect Environmental Impacts Resulting from Increased Groundwater Extraction and Use in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Biological Resources	Construction activities could result in disturbance of aquatic features (e.g., wetlands) regulated by the Army Corps of Engineers, Regional Water Quality Control Boards, and Department of Fish and Game; disturbance of special-status species and their habitats; disturbance of sensitive natural communities. Extraction of groundwater could result in reduced surface water flows, particularly summer flows, which could harm riparian vegetation or degrade habitat for sensitive species.	Potentially significant depending on the characteristics of the specific action taken.
Cultural Resources	Construction activities could result in disturbance of cultural resources. Siting of pumps and appurtenant infrastructure could impair the significance of historical resources.	Potentially significant depending on the characteristics of the specific action taken.
Geology/Soils	Construction activities could result in erosion or loss of topsoil during and immediately following construction.	Potentially significant depending on the characteristics of the specific action taken.
Hazards/Hazardous Materials	Increased groundwater extraction could result in increased use of hazardous materials associated with construction, operation, and maintenance of new or existing appurtenant facilities.	Potentially significant depending on the characteristics of the specific action taken.
Hydrology/Water Quality	Construction activities could result in short-term increases in sedimentation and degradation of water quality. Extraction of groundwater could result in reduced surface water flows, particularly summer flows, which could adversely affect water temperature and increase constituent concentrations due to reduced dilution. The production rates of nearby wells could drop. Long term increased groundwater extraction could lead to groundwater overdraft depending on the site specific hydrogeologic conditions.	Potentially significant depending on the characteristics of the specific action taken.

Table 6-5. Possible Indirect Environmental Impacts Resulting from Increased Groundwater Extraction and Use in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Land Use/Planning	Construction activities and siting of infrastructure could result in conflicts with land use plans, policies or regulations adopted for the purpose of avoiding or mitigating environmental effects by agencies with jurisdiction within the project area.	Potentially significant depending on the characteristics of the specific action taken.
Mineral Resources	Increased groundwater extraction will not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State and will not result in the loss of locally important mineral resources recovery sites that are delineated on a local general plan, specific plan, or other land use plan.	Not significant.
Noise	Short-term increased noise from construction of new groundwater pumping facilities; long-term increased noise due to the operation of pumps.	Potentially significant depending on the characteristics of the specific action taken.
Population/Housing	Increased groundwater extraction will not result in substantial population growth, will not displace substantial numbers of people, and will not displace substantial numbers of existing housing units.	Not significant.
Public Services	Increased groundwater extraction will not affect public services.	Not significant.
Recreation	Extraction of groundwater could result in reduced surface water flows, particularly summer flows, which could adversely affect recreational opportunities.	Potentially significant depending on the characteristics of the specific action taken.
Transportation/Traffic	Construction activities could result in localized, short-term increases in traffic.	Potentially significant depending on the characteristics of the specific action taken.
Utilities/Service Systems	Construction activities could result in localized, short-term disruption of utility service. Reliance on groundwater could result in expansion of existing water and energy delivery systems.	Potentially significant depending on the characteristics of the specific action taken.

6.3 Construction of New and Expansion of Existing Offstream Storage

6.3.1 How Implementation of the Proposed Regulation May Give Rise to This Result

The proposed regulation's requirement that diversions of water for frost protection use be conducted in accordance with an approved water demand management program could lead some affected persons to construct or modify offstream storage reservoirs to help reduce the instantaneous demand on surface water during frost events. These actions could give rise to indirect environmental impacts. State Water Board approval would be required in order to develop a new storage right or convert an existing permitted or licensed right from a direct diversion right to a storage right.

6.3.2 Issues and Potential Effects

A range of potential future demands for offstream storage were estimated in order to fully evaluate the potential environmental effects of changing the method of water diversion for frost protection from direct diversion to offstream storage. The lower end of the range was obtained by assuming offstream storage would be used to frost protect the entire lower range of affected acreage listed in table 6-2. Likewise, the upper end of the range was obtained by assuming offstream storage would be used to frost protect the entire upper range of affected acreage listed in table 6-2. The standard area capacity relationship used by the National Resource Conservation Service was used to determine the acreage that could be affected by construction or expansion of offstream reservoirs. The area capacity relationship equation is reservoir capacity equals surface area times max depth times average bank slope[25]. Solving for surface area the equation becomes surface area equals reservoir capacity divided by the sum of maximum depth times average bank slope. To determine the total acreage that could be affected in the project area, the estimated acre-feet per year needed to frost protect the affected range of acreage from table 6-3 was used for capacity, the max depth was estimated to average 8 feet, and the average bank slope was estimated to be 0.4. Estimates of the range of future storage demands and the potential range of acreage displaced by offstream storage reservoirs are provided in table 6-6.

[25] Natural Resources Conservation Service-USDA, "Ponds – Planning, Design, Construction", Agriculture Handbook 590, November, 1997. P12.

Table 6-6. Estimated Potential Future Offstream Storage Requirements and Acres Displaced by Construction or Modification of Offstream Storage Reservoirs in the Project Area

County	Future Offstream Storage Demands (acre-feet/year)		Acreage Displaced by Offstream Storage	
	Lower	Upper	Lower	Upper
Mendocino	410	6200	130	1940
Sonoma	775	9,025	250	2820

Possible impacts that might result from construction and modification of offstream storage are discussed in table 6-7, Possible Indirect Environmental Impacts Resulting from Construction of New and Expansion of Existing Offstream Storage in Response to the Proposed Regulation.

Table 6-7. Possible Indirect Environmental Impacts Resulting from Construction of New and Expansion of Existing Offstream Storage in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Aesthetics	Construction activities could result in short-term disturbances to visual resources; development of offstream storage could result in long-term change in visual character or quality.	Potentially significant depending on the characteristics of the specific storage reservoir, particularly in public areas with highly scenic views.
Agriculture Resources	Development of storage could result in reductions in irrigable farmland.	Potentially significant depending on the characteristics of the specific storage reservoir.
Air Quality	Construction activities could result in short-term contribution to PM10, ozone, nitrogen oxides, carbon monoxide or other pollutant levels. Pumps may be utilized during offstream reservoir operation to direct water to the offstream storage facility. Increased long term operation of pumps could result in increased greenhouse gas emissions (primarily carbon dioxide, methane, nitrous oxide, and ozone) that may contribute to global climate change.	Potentially significant depending on the characteristics of the specific storage reservoir.
Biological Resources	Development of storage could result in disturbance of aquatic features (e.g., wetlands)	Potentially significant depending on the characteristics of the specific storage reservoir.

Table 6-7. Possible Indirect Environmental Impacts Resulting from Construction of New and Expansion of Existing Offstream Storage in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
	regulated by the Army Corps of Engineers, Regional Water Quality Control Boards, and Department of Fish and Game; could disturb special-status species and their habitats; could disturb sensitive natural communities; and could increase invasive species habitat.	
Cultural Resources	Construction activities could disturb cultural resources. Location of offstream storage could impair the significance of historical resources.	Potentially significant depending on the characteristics of the specific storage reservoir.
Geology/Soils	Erosion or loss of topsoil during and immediately following construction activities could occur. Relocation of onstream storage could result in exposure of people or structures to potential fault rupture, seismic ground shaking, landslide, or other geologic hazard.	Potentially significant depending on the characteristics of the specific storage reservoir.
Hazards/Hazardous Materials	Construction activities could result in increased use of hazardous materials.	Potentially significant depending on the characteristics of the specific storage reservoir.
Hydrology/Water Quality	Construction activities could result in short-term increases in sedimentation and degradation of water quality; could shift timing of diversions, reducing winter flows.	Potentially significant depending on the characteristics of the specific storage reservoir.
Land Use/Planning	Construction activities and location of offstream storage could conflict with land use plans, policies or regulations adopted for the purpose of avoiding or mitigating environmental effects by agencies with jurisdiction within the project area.	Potentially significant depending on the characteristics of the specific storage reservoir.

Table 6-7. Possible Indirect Environmental Impacts Resulting from Construction of New and Expansion of Existing Offstream Storage in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Mineral Resources	Construction activities and relocation of onstream storage could result in the loss of availability of a mineral resource that could be of value to the region and the residents of the State and could result in the loss of locally-important mineral resources recovery sites that may be delineated on a local general plan, specific plan, or other land use plan.	Potentially significant depending on the characteristics of the specific storage reservoir.
Noise	Construction activities could result in short-term increases in noise.	Potentially significant depending on the characteristics of the specific storage reservoir.
Population/Housing	Construction activities and offstream storage development will not result in substantial population growth, will not displace substantial numbers of people, and will not displace substantial numbers of existing housing units.	Not significant.
Public Services	Construction activities and offstream storage development will not affect public services.	Not significant.
Recreation	Construction Activities and offstream storage development will not affect recreation.	Not significant.
Transportation/Traffic	Construction activities could result in localized, short-term increases in traffic.	Potentially significant depending on the characteristics of the specific storage reservoir.
Utilities/Service Systems	Construction activities could result in localized, short-term disruption of utility service.	Potentially significant depending on the characteristics of the specific storage reservoir.

6.4 Removal or Modification of Surface Water Diversion Structures

6.4.1 How Implementation of the Proposed Regulation May Give Rise to This Result

The proposed regulation's requirement that diversions of water for frost protection use be conducted in accordance with an approved water demand management program could lead some diverters to remove or modify their surface water diversion structures as a result of choosing an alternative method of frost protection. Diverters who either cease using water for purposes of frost protection altogether or change their water supply from surface water diversions to groundwater would no longer need a surface water diversion structure and therefore could remove it. Surface water diverters who switch to offstream storage may modify their diversion structure to reduce the amount of pump intake storage needed. These actions could give rise to indirect environmental impacts.

6.4.2 Issues and Potential Effects

In general, the foreseeable, indirect environmental consequences of these diversion structure modifications would likely be beneficial in terms of anadromous fish passage and habitat, and adverse with respect to construction-related effects that may cause short-term impacts on aesthetic, water, and biological resources and short-term noise-related impacts. Surface water diversion structure removal can have beneficial ecological effects in terms of returning the stream to a more natural hydrograph, temperature regime, dissolved oxygen content, and sediment transport system. It can promote the rehabilitation of native species including fish; biodiversity and the population densities of native aquatic organisms increase when structures are removed. The removal of a surface water diversion structure may provide new upstream habitat to anadromous fish if they were unable to pass the structure previously. It can reduce predation of endangered anadromous fish that get caught in pools below structures. Removal of diversion structures returns the natural flow of streams, which benefits the life cycles of many aquatic organisms. Frequent and more natural flooding resulting from diversion structure removal may promote wetland and riparian growth along river edges.

Diversion structure removal can also cause potentially significant adverse effects. While some of these effects, such as the increase in turbidity removal, are relatively short-lived, other effects are not. The loss of impounded water behind the structures, for example, would reduce the available habitat used by special-status species such as the western pond turtle and red-legged frog. Dewatering of an impoundment behind a diversion structure after removal can result in loss of wetlands. Heavy metals, dissolved nutrients, toxicants attached to sediment particles, and other contaminants trapped in the sediments stored behind diversion structures can, when released, cause adverse effects to downstream organisms and water quality, depending on the type and quantity of the contaminant (American

Rivers 2002, American Rivers and Trout Unlimited 2002, ICF Consulting 2005, NSR 2000, Stetson Engineers 2007).

A range of future surface water diversion structures that could potentially be removed or modified was estimated in order to fully evaluate the potential environmental effects of removing or modifying surface water diversion structures. To calculate the range of diversion structures that may be modified or removed, the acre-feet of water needed for frost protection per year for an average vineyard or orchard was estimated. This value was divided into the total water supply needed for each county to come up with an estimate of the range of diversion structures that may be removed or modified. In 2006, in Sonoma County, there were over 1800 growers operating vineyards on 63,825 acres (Frey, 2006). Based on those estimates this analysis will use an average vineyard or orchard size of 35 acres. Estimates of the range of surface water diversion structures that may be modified or removed are provided in table 6-8.

Table 6-8. Estimated Potential Future Number of Surface Water Diversion Structures Modified or Removed in the Project Area

	Mendocino County		Sonoma County		Total Project Area	
	Lower	Upper	Lower	Upper	Lower	Upper
Range of Affected acreage	**1,020**	**15,500**	**2,763**	**32,225**	**3,783**	
Water Supply Needed for Frost Protection (af/ac/yr)	**0.40**[1]	**0.40**	**0.28**[2]	**0.28**	**-----**	**-----**
Total Water Supply Needed for Frost Protection (af/yr)	**410**	**6200**	**775**	**9,025**	**1185**	**15,225**
Water Supply Needed for Frost Protection for a Average Size Vineyard/Orchard[3] **(af/yr)**	**14**	**14**	**10**	**10**	**-----**	**-----**
Estimated Number of Surface Water Diversion Structures That Could Be Removed or Modified.	**30**	**445**	**80**	**905**	**110**	**1350**

[1]Table 3-6, Appendix D

[2]Value for Sonoma County was assumed to be equivalent to Hopland water requirements

[3]Average Vineyard/Orchard is assumed to be 35 acres in size

Possible impacts that might result from removal or modification of existing surface water diversion structures are discussed in table 6-9, Possible Indirect Environmental Impacts Resulting from Removal or Modification of Surface Water Diversion Structures in Response to the Proposed Regulation.

Table 6-9. Possible Indirect Environmental Impacts Resulting from Removal or Modification of Surface Water Diversion Structures in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Aesthetics	Construction activities could result in short-term disturbances to visual resources	Potentially significant depending on the characteristics of the specific diversion structure.
Agriculture Resources	Removal or modification of diversion structures will not affect agricultural resources.	Not significant
Air Quality	Construction activities could result in short-term contribution to PM10, ozone, nitrogen oxides, carbon monoxide or other pollutant levels.	Potentially significant depending on the characteristics of the specific diversion structure.
Biological Resources	Removal or modification of diversion structures could result in disturbance of aquatic features (e.g., wetlands) regulated by the Army Corps of Engineers, Regional Water Quality Control Boards, and Department of Fish and Game; could disturb special-status species and their habitats; and could disturb sensitive natural communities.	Potentially significant depending on the characteristics of the specific diversion structure.
Cultural Resources	Construction activities could disturb cultural resources.	Potentially significant depending on the characteristics of the specific diversion structure.
Geology/Soils	Erosion or loss of topsoil during and immediately following construction activities could occur.	Potentially significant depending on the characteristics of the specific diversion structure.
Hazards/Hazardous Materials	Construction activities could result in increased use of hazardous materials.	Potentially significant depending on the characteristics of the specific diversion structure.
Hydrology/Water Quality	Construction activities could result in short-term increases in sedimentation and degradation of water quality; changes in channel processes and release of sediment following diversion structure removal; and reduction in	Potentially significant depending on the characteristics of the specific diversion structure.

Table 6-9. Possible Indirect Environmental Impacts Resulting from Removal or Modification of Surface Water Diversion Structures in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
	detention of storm flows and increased potential flooding.	
Land Use/Planning	Removal or modification of diversion structures could conflict with land use plans, policies or regulations adopted for the purpose of avoiding or mitigating environmental effects by agencies with jurisdiction within the project area.	Potentially significant depending on the characteristics of the specific diversion structure.
Mineral Resources	Diversion structure removal or modification will not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State and will not result in the loss of locally-important mineral resources recovery sites that are delineated on a local general plan, specific plan, or other land use plan	Not significant.
Noise	Construction activities could result in short-term increases in noise.	Potentially significant depending on the characteristics of the specific diversion structure.
Population/Housing	Diversion structure removal or modification will not result in substantial population growth, will not displace substantial numbers of people, and will not displace substantial numbers of existing housing units.	Not significant.
Public Services	Diversion structure removal or modification could result in reductions of reservoir storage capacity available for fire protection.	Not significant
Recreation	Diversion structure removal or modification could result in a loss of recreational opportunities.	Potentially significant depending on the characteristics of the specific diversion structure.
Transportation/Traffic	Construction activities could result in localized, short-term increases in traffic.	Not significant.
Utilities/Service Systems	Construction activities could result in localized, short-term disruption of utility service.	Potentially significant depending on the characteristics of the specific diversion structure.

6.5 Effects of Installing and Operating Wind Machines

6.5.1 How Implementation of the Proposed Regulation May Give Rise to This Result

The proposed regulation's requirement that diversions of water for frost protection use be conducted in accordance with an approved water demand management program could lead some affected persons to change their method of frost protection. Wind machines are an effective method of frost protection during radiation frost events and for vineyards and orchards located in less frost sensitive sites. Wind machines work by mixing the colder stratified air near the ground with the warmer inversion layer aloft. The three main types of wind machines are tower machines, tower-less machines, and ground-level mobile machines (frost fans). Tower machines are the most common type and are designed to draw warm air down and mix it with the cold air near the surface. Tower-less machines are designed to blow the heavy, cold air near the surface upward to mix it with the lighter, warmer air above and circulate the mixed air back down to the surface. Ground-level mobile machines are designed to blow cold air out of the site and have it replaced by the warmer air above. The effectiveness of these machines depends on terrain, vineyard/orchard layout, and inversion layer conditions. Wind machines are powered by electric motors, gasoline powered motors, liquefied gas powered motors, or diesel engines. Depending on the terrain and contour, an individual wind machine can effectively protect, on average, 10 acres of crops (Domoto, 2006).

6.5.2 Issues and Potential Effects

A range of potential future demand for installation and use of wind machines was estimated in order to fully evaluate the potential environmental effects of using this alternative method of frost protection. Success of wind machines to protect crops during frost events depends on site specific topography, vineyard/orchard layout, and frost conditions. This analysis did not consider these site specific variables when estimating the magnitude of future demand for wind machines.

The range of potential use was estimated by taking into consideration the use of wind machines in conjunction with other methods such as heaters or overhead sprinklers. The effectiveness of wind machines depends on the strength of the inversion layer, wind conditions, and the vineyard/orchard layout and contour. Wind machines, by themselves, are not effective in wind over 5 mph or during advection frosts and radiation frosts with a weak inversion layer. Combining the use of wind machines and heaters during weak inversions and light advection frosts has shown to improve the effectiveness of both systems in raising the site temperature. Due to the convective currents created by heaters the effective area of wind machines may be reduced (Domoto, 2006). Combining the use of wind machines with overhead sprinklers would reduce the seasonal dependency of water for frost protection. The wind machines could be used during radiation frosts with strong inversion layers and the overhead sprinklers would only be used during radiation frosts with weak inversion layers and advective frosts. Wind machines and overhead sprinklers

should never be used at the same time for frost protection so the effectiveness of this combination would depend on accurate frost forecasts to ensure that a strong enough inversion layer will exist before committing to turning on the wind machines.

The potential area and number of diverters that might use wind machines in conjunction with other methods frost protection was determined by overlaying the SWRCB EWRIMS Russian River Frost Points of Diversion layer with a layer created by WorldClim (2005) that displays the average minimum temperature in March from 1950 through 2000. The map is displayed in Figure 6-1.

Insert Figure 6-1

Figure 6-1. March Average Minimum Temperature (1950 – 2000)

For the purposes of this analysis, it was assumed that diverters located in regions where the average minimum temperature was greater than 4°C would be able to protect their crops from frost by using wind machines in conjunction with other methods of frost protection. The percent of diverters that lie within that temperature zone was applied to the range of affected acreage in table 6-2 to get the total acreage that could potentially use wind machines for frost protection. This analysis assumes an individual wind machine, on average, can effectively protect 10 acres of crops, as discussed in Domoto (2006).

The range of potential future acreage protected by wind machines and number of wind machines by county is located in table 6-10.

Table 6-10. Estimated Potential Number of Future Wind Machines That May Be Installed in the Project Area in Response to the Proposed Regulation

	Mendocino County		Sonoma County		Total Project Area	
	Lower	**Upper**	**Lower**	**Upper**	**Lower**	**Upper**
Range of Affected acreage	**1,020**	**15,500**	**2,763**	**32,225**	**3,783**	**47,725**
Percent of Diverters that may Choose to Frost Protect with Wind Machines	**20%**	**20%**	**86%**	**86%**	**-----**	**-----**
Acreage that may be Frost Protected with Wind Machines	**205**	**3,100**	**2,375**	**27,715**	**2,580**	**30,815**
Number of Wind Machines that may be Installed at 1 per 10 acres	**25**	**310**	**240**	**2,775**	**265**	**3,085**

Possible impacts that might result from installation and use of wind machines are discussed in table 6-11, Possible Indirect Environmental Impacts Resulting from Installation and Operation of Wind Machines.

Table 6-11. Possible Indirect Environmental Impacts Resulting from Installation and Operation of Wind Machines in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Aesthetics	Construction activities could result in short-term disturbances of visual resources; siting of wind machines could result in long-term change in visual character or quality.	Potentially significant depending on the characteristics of the specific action taken.

Table 6-11. Possible Indirect Environmental Impacts Resulting from Installation and Operation of Wind Machines in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Agriculture Resources	Siting of wind machines could result in minor reductions in irrigable farmland.	Not Significant.
Air Quality	Construction activities could result in short-term contribution to PM10, ozone, nitrogen oxides, carbon monoxide, or other pollutant levels. Reliance on wind machines for frost protection could result in long term operation of motors, which could result in increased greenhouse gas emissions (primarily carbon dioxide, methane, nitrous oxide, and ozone) that may contribute to global climate change.	Potentially significant depending on the characteristics of the specific action taken.
Biological Resources	Construction, operation, and maintenance could result in disturbance of special-status species and their habitats; could increase bird and bat mortality; and could disturb sensitive natural communities.	Potentially significant depending on the characteristics of the specific action taken.
Cultural Resources	Construction activities could disturb cultural resources. Siting of wind machines could impair the significance of historical resources.	Potentially significant depending on the characteristics of the specific action taken.
Geology/Soils	Construction activities could result in erosion or loss of topsoil during and immediately following construction.	Potentially significant depending on the characteristics of the specific action taken.
Hazards/Hazardous Materials	Construction, operation and maintenance of wind machines could result in increased use of hazardous materials.	Potentially significant depending on the characteristics of the specific action taken.
Hydrology/Water Quality	Construction activities could result in short-term increases in sedimentation and degradation of water quality.	Potentially significant depending on the characteristics of the specific action taken.
Land Use/Planning	Construction activities and siting of wind machines could result in conflicts with land use plans, policies or regulations adopted for the purpose of avoiding or mitigating environmental effects by agencies with jurisdiction within the project area.	Potentially significant depending on the characteristics of the specific action taken.
Mineral Resources	Construction activities will not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State and will not result in the loss of locally important mineral resources recovery sites that are delineated on a local general plan, specific plan, or other land use plan.	Not significant.

Table 6-11. Possible Indirect Environmental Impacts Resulting from Installation and Operation of Wind Machines in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Noise	Construction, operation, and maintenance activities could result in increases in noise.	Potentially significant depending on the characteristics of the specific action taken.
Population/Housing	Construction, operation, and maintenance activities will not result in substantial population growth, will not displace substantial numbers of people, and will not displace substantial numbers of existing housing units.	Not Significant
Public Services	Construction, operation, and maintenance activities will not affect public services.	Not significant.
Recreation	Construction, operation, and maintenance activities will not affect recreation opportunities.	Not significant.
Transportation/Traffic	Construction activities could result in localized, short-term increases in traffic.	Potentially significant depending on the characteristics of the specific action taken.
Utilities/Service Systems	Construction activities could result in localized, short-term disruption of utility service.	Potentially significant depending on the characteristics of the specific action taken.

6.6 Effects of Installing and Operating Orchard Heaters

6.6.1 How Implementation of the Proposed Regulation May Give Rise to This Result

The proposed regulation's requirements that diversions of water for frost protection use be conducted in accordance with an approved water demand management program could lead some affected persons to change to an alternative method of frost protection that does not rely on water. Using heat to raise surface temperatures during frost events is one of the oldest methods of frost protection. There are a variety of orchard heater systems currently in use including oil burning, stack heaters, and liquefied gas and propane distribution systems. Heaters are either fueled individually or by a pipeline distribution system. Current methods employ large numbers of smaller heaters to heat the air as uniformly as possible and prevent puncturing the inversion layer. Approximately 75-85% of the energy produced by heaters is released through hot gases emitted by the heater stack. This helps to initiate convective mixing in the crop area by tapping the warm air above the inversion. The heat however, can be lost due to radiation to the sky when the inversion layer is too high or by wind pushing the heated air out of the vineyard/orchard. The remaining 10-25% of energy produced by heaters is released

by radiation to the surrounding area at the surface level. The benefit of the radiant heat only travels to the closer, adjacent vegetation. A minimal amount of heat is conducted from the heater to the soil. Current methods suggest an average of 40 heaters per acre. Propane heaters give off less heat than other fuel types and require closer to 50 heaters per acre (Evans, 1999).

6.6.2 Issues and Potential Effects

A range of potential future demand for orchard heaters was estimated in order to fully evaluate the potential environmental effects of alternative methods of frost protection. The lower and upper ranges were estimated using the same approach described in section 6.5.2 for wind machines to estimate the percentage of diverters who may install and operate orchard heaters for frost protection. The potential affected acreage and percent of diverters who could potentially use orchard heaters for frost protection are the same as the numbers obtained for the lower and upper ranges in the analysis for wind machines. The effectiveness of orchard heaters depends on the local topography and weather patterns. At a site specific level, orchard heaters, by themselves, could potentially be an effective option for frost protection within the project area. Current methods suggest an average of 40 heaters per acre for frost protection, if used alone (Evans, 1999). Due to the size of the project area this analysis does not consider site specific factors in the evaluation of implementation levels for frost protection. Similar to wind machines, this analysis estimates the range of potential use by taking into consideration the use of orchard heaters in conjunction with other frost protection methods. As described in the previous section, the use of a combination of heaters and wind machines increases the overall efficiency of both frost protection methods. Using a combination of wind machines and heaters reduces the number of heaters needed per acre by at least 50% (Evans, 1999). For purposes of this analysis the lower and upper end of the range takes into consideration the use of orchard heaters in conjunction with wind machines. The lower and upper range analysis therefore assumes the use of diesel burning heaters placed at an average of 20 heaters per acre. The range of potential future acreage that could be protected by orchard heaters and the estimated number of orchard heaters by county is located in table 6-12.

Table 6-12. Estimated Potential Number of Future Orchard Heaters That May Be Installed in the Project Area in Response to the Proposed Regulation						
	Mendocino County		Sonoma County		Total Project Area	
	Lower	Upper	Lower	Upper	Lower	Upper
Range of Affected Acreage	**1,020**	**15,500**	**2,763**	**32,225**	**3,783**	**47,725**
Percent of Diverters that may Choose to Frost Protect with Orchard Heaters	**20%**	**20%**	**86%**	**86%**	**-----**	**-----**
Acreage that may be Frost Protected with Orchard Heaters	**204**	**3,100**	**2,376**	**27,715**	**2,580**	**30,815**
Number of Orchard Heaters that may be Installed at 20 per acre	**4080**	**62,000**	**47,520**	**554,300**	**51,600**	**616,300**

The California Air Resources Board regulates the use and sale of orchard heaters. Health and Safety Code section 41860 states that no person shall use any orchard heater unless it has been approved by the Air Resources Board or does not produce more than one gram per minute of unconsumed solid carbonaceous material.

Due to the current cost of oil it is likely owners would install orchard heaters that use either propane or natural gas as fuel sources. These heaters are commonly connected by central pipeline systems, are the most efficient, and produce negligible hydrocarbon emissions. The most conservative analysis; however, would be to assume a worst case scenario for air emissions, which would occur if orchard heaters using diesel fuel are used.

The Northern Sonoma County Air Pollution Control District stated that using the methodology from the San Joaquin Valley Unified Air Pollution Control District Emission Inventory Methodology, 052 Orchard Heaters was an appropriate approach to evaluate the cumulative emissions for orchard heaters using diesel fuel. The emission factors for orchard heaters that use diesel fuel are shown in table 6-13. Table 6-14 displays total emission factors per frost event and annually for the lower and upper ranges of potential future orchard heater use. Table 6-13 uses the hours per frost event (6 hours) and the total annual hours of frost events (Mendocino County 138 hours and Sonoma County 78 hours) from table 4-9 of appendix D.

Table 6-13. Emission Factor for Orchard Heaters (pounds per heater hour)				
CO	NO_x	SO_2	VOC	PM
0.005	**Negligible**	**0.007**	**16.0**	**0.132**

Table 6-14. Estimated Potential Future Orchard Heater Emissions in the Project Area

Emissions	Mendocino		Sonoma		Total	
	Lower	Upper	Lower	Upper	Lower	Upper
CO per Frost Event (tons)	.06	0.93	0.71	8.31	0.77	9.24
SO_2 per Frost Event (tons)	.09	1.30	1.00	11.64	1.09	12.94
VOC per Frost Event (tons)	196	2976	2281	26,606	2477	29,582
PM per Frost Event (tons)	1.6	24.6	18.9	220.0	20.5	244.6
CO Annually (tons)	1.41	21.39	9.27	108.09	10.68	129.48
SO_2 Annually (tons)	1.97	29.95	12.97	151.32	14.94	181.27
VOC Annually (tons)	4504	68448	29,652	345,883	34,156	414,331
PM Annually (tons)	37.2	565.9	245.1	2859.5	282.3	3425.4

Possible indirect impacts that might result from the use of orchard heaters are discussed in table 6-15, Possible Indirect Environmental Impacts Resulting from the Use of Orchard Heaters.

Table 6-15. Possible Indirect Environmental Impacts Resulting from the Installation and Operation of Orchard Heaters in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Aesthetics	Installation of orchard heaters will not affect aesthetic resources.	Not Significant
Agriculture Resources	Installation of orchard heaters will not affect agricultural resources.	Not Significant
Air Quality	Use of orchard heaters during frost events could result in increased contribution to PM10, ozone, carbon monoxide or other pollutant levels. Increased use of orchard	Potentially significant depending on the characteristics of the specific action taken.

Table 6-15. Possible Indirect Environmental Impacts Resulting from the Installation and Operation of Orchard Heaters in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
	heaters could result in increased greenhouse gas emissions (primarily carbon dioxide, methane, and ozone) that may contribute to global climate change.	
Biological Resources	Pipeline installation could result in minor ground disturbance and some generation of noise.	Not Significant
Cultural Resources	Pipeline installation activities could result in disturbance of cultural resources.	Potentially significant depending on the characteristics of the specific action taken.
Geology/Soils	Pipeline installation could result in minimal, short-term erosion or loss of topsoil.	Not significant
Hazards/Hazardous Materials	Installation, operation and maintenance of orchard heaters could result in increased use of hazardous materials.	Potentially significant depending on the characteristics of the specific action taken.
Hydrology/Water Quality	Pipeline installation activities could result in minimal, short-term increases in sedimentation and degradation of water quality.	Not Significant
Land Use and Planning	Pipeline installation and orchard heater use may result in conflicts with land use plans, policies or regulations adopted for the purpose of avoiding or mitigating environmental effects by agencies with jurisdiction within the project area.	Potentially significant depending on the characteristics of the specific action taken.
Mineral Resources	Pipeline installation activities will not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State and will not result in the loss of locally important mineral resources recovery sites that are delineated on a local general plan, specific plan, or other land use plan.	Not significant.
Noise	Pipeline installation activities could result in short-term increases in noise.	Not significant.
Population/Housing	Pipeline installation activities and orchard heater use will not result in substantial population growth, will not displace substantial numbers of people, and will not displace substantial numbers of existing	Not significant

Table 6-15. Possible Indirect Environmental Impacts Resulting from the Installation and Operation of Orchard Heaters in Response to the Proposed Regulation

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
	housing units.	
Public Services	Pipeline installation activities and orchard heater use will not affect public services.	Not significant.
Recreation	Pipeline installation activities and orchard heater use will not affect recreation opportunities.	Not significant.
Transportation/Traffic	Pipeline installation activities could result in localized, short-term increases in traffic.	Not significant.
Utilities/ Service Systems	Pipeline installation activities could result in localized, short-term disruption of utility service.	Potentially significant depending on the characteristics of the specific action taken.

6.7 Effects of Installing Stream Stage Gages

6.7.1 How Implementation of the Proposed Regulation May Give Rise to This Result

The proposed regulation would require the development of a stream stage monitoring program to evaluate the potential for diversions for frost protection use to result in salmonid stranding mortality. The number, type, and location of the stream stage gages would be determined by the governing body in consultation with NMFS and DFG. The environmental impacts of installing stream gages would be direct impacts of the regulation. Since the proposed regulation does not specify the method of compliance with this requirement, it is anticipated that less costly stream gages, such as pressure transducer data loggers and data loggers with telemetry via radio, cell phone or satellite, would be considered first, prior to considering other more expensive options, such as USGS-rated stream gages. Less than significant effects would occur with the installation of less costly stream gages, while installation of USGS rated stream gages could give rise to significant effects.

Installation of pressure transducer data loggers and data loggers with telemetry require minimal stream channel and upland disturbance, and are anticipated to result in less than significant impacts. Installation of the gages entails identifying the sensitive stream reach and selecting a gage site in a deep pool at, above or below the sensitive stream section. Once a sensor site is chosen, a T-stake or other suitable rigid mounting pole is driven into the streambed. The sensor is attached to the T-stake and as close as possible to the base of the pool. A staff gage may also be installed near the sensor to aid in the visual determination of stream stage. Installation of the staff gage is very similar to installation of the sensor.

The data loggers with telemetry require a site with unobstructed sun exposure for solar charging to minimize battery replacement visits. Installation of the solar panel may include minor excavation for a footing for a mounting pole that holds the panel. The footing is filled with excavated material or concrete mix.

The installation of these gages does not require significant stream channel or upland disturbance. There may be some short-term increases in turbidity and minor substrate disturbance during the installation of the mounting pole. There is a potential for erosion of displaced soil from the sensors with telemetry if it is not dispersed onto the surrounding site. Installation of the gages could cause minor short-term disturbance to biological resources that use pool habitat. These are small, isolated short-term impacts that are not significant environmental impacts.

Some stream stage monitoring programs may call for the installation of USGS rated stream gages. Installation would require the excavation of a rectangular area of land 5 feet by 5 feet by 2 feet for the gage house concrete slab that would be placed adjacent to the stream. The new gage house would be installed on top of the slab. Piping would run from the gage house down the embankment and into the water. At the end of the pipe in the river, an anchor would be used to keep the end of the pipe stable. Anchors are typically concrete cylinders that are 18 inches in diameter and 15 inches deep. Depending on the site, the concrete cylinder may be poured around a T-stake and the T-stake portion is then driven into the streambed to improve the anchor's stability. A staff gage would also be installed. There would potentially be some removal of vegetation at the slab excavation site and in the river channel. Minimal digging and trenching may be required on the embankment. Depending on the site, some stream channel alteration may be required (United States Department of the Interior Bureau of Reclamation, 2008). Installation of USGS rated stream gages may cause minor land and stream channel disturbance which could result in significant impacts.

6.7.2 Issues and Potential Effects

A range of potential USGS rated stream gage installations was estimated in order to fully evaluate potential environmental effects. As indicated in section 4.2 of appendix D, it is estimated that a total of 71 stream gages may need to be installed. Most of these gages are anticipated to be pressure transducer data loggers or data loggers with telemetry. The upper end of the estimated number of USGS rated gages assumes that these types of gages could be installed at 25 locations. This quantity is consistent with the estimated number of telemetry stations listed in table 4-2 of appendix D. The lower end of the range assumes that a USGS rated stream gage will be installed at the bottom of each of the eight major watershed within the project area, as shown in Figure 4-1. Possible impacts that might result from installation of USGS rated stream gages are discussed in table 6-16, Possible Environmental Impacts Resulting from Installation and Operation of Stream Stage Gages.

Table 6-16. Possible Environmental Impacts Resulting from Installation of USGS Rated Stream Gages

ENVIRONMENTAL ISSUE AREA	POSSIBLE ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Aesthetics	Installation of gages will have a minor affect on aesthetic resources.	Not significant.
Agriculture Resources	Installation of gages will not affect agricultural resources.	Not significant.
Air Quality	Construction activities could result in short-term contribution to PM10, ozone, nitrogen oxides, carbon monoxide or other pollutant levels.	Not significant
Biological Resources	Installation activities could result in disturbance of aquatic features (e.g., wetlands) regulated by the Army Corps of Engineers, Regional Water Quality Control Boards, and Department of Fish and Game; could result in minor ground disturbance, very minor loss of open space (i.e. from concrete pad installation), and some generation of noise. Several special-status species are expected to occur in the potential project areas and may experience some minor effects. Site specific studies will need to be completed prior to construction to ensure the location and timing of construction does not cause a significant impact to these species.	Potentially significant depending on the location and timing of the specific action taken.
Cultural Resources	Installation of stream gages will require a site specific study to determine the potential to affect historic properties and Indian trust assets. The location of gages can be relocated, if necessary, to protect these resources.	Not significant.
Geology/Soils	Construction activities will result in minor ground disturbance and the potential for short-term increases in erosion.	Not significant.
Hazards/Hazardous Materials	Construction activities could result in increased use of hazardous materials.	Not significant.
Hydrology/Water Quality	Installation of gages will not affect the overall flow or water quality of the streams. Construction activities require minor stream channel alteration and have the potential to cause short-term increases in turbidity and sedimentation.	Potentially significant depending on the characteristics of the specific action taken.
Land Use/Planning	Land use would remain the same. The governing body would contact and coordinate with land owner, district, or authority as appropriate, for entry permits, easements, or licenses needed for access and entry to sites for construction, and long-term monitoring and maintenance.	Not significant.

Table 6-16. Possible Environmental Impacts Resulting from Installation of USGS Rated Stream Gages

ENVIRONMENTAL ISSUE AREA	POSSIBLE ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Mineral Resources	Installation of gages will not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State and will not result in the loss of locally important mineral resources recovery sites that are delineated on a local general plan, specific plan, or other land use plan.	Not significant.
Noise	Construction activities could result in a short-term increase in noise.	Not significant.
Population/Housing	Installation of gages will not result in substantial population growth, will not displace substantial numbers of people, and will not displace substantial numbers of existing housing units.	Not significant.
Public Services	Installation of gages will not affect public services.	Not significant.
Recreation	Installation of gages will not affect recreation opportunities.	Not significant.
Transportation/Traffic	Installation of gages will not affect transportation and traffic.	Not significant.
Utilities/Service Systems	Installation of gages will not affect utilities and service systems.	Not significant.

6.8 Other Potential Actions That May Be Taken by Affected Persons That Are Not Anticipated to Result in Significant Impacts to the Environment

As discussed in section 6.7, installation of non-USGS stream gages is anticipated to result in less than significant impacts to the environment. There are other potential actions that may be taken that would result in less than significant impacts to the environment. These include installation of diversion monitoring equipment and conversion of irrigation systems from drip lines to low-flow emitters.

Frost diversions from surface or ground water are most typically made with pumps powered by electricity, diesel or natural gas. The actions affected persons may take in order to prevent stranding mortality may include better coordination of diversions and real-time diversion monitoring. In order to implement these actions, frost users may choose to use existing, or new, in-line flow meters. New meters would be installed on the discharge side of the pump and in close proximity to the pump. New installation may require minor excavation of a section of pipeline for direct mounting

of meter. Automated meters may also require wiring to electrical, battery or solar power source. Because this installation is close to the existing pumping plant where day to day maintenance and operation have created a working area, minimal environmental disturbance is expected. The environmental impacts from the installation and operation of automated meters to monitor water diversion rates are anticipated to be less than significant.

Frost diverters with onstream dams, or that use gravity diversion from a stream, may install a staff gage or pressure transducer in the reservoir storage area or stream channel for monitoring of stage levels. The frost user would then need to perform manual or automated calculation of diversion. The environmental impacts from the installation and operation of staff gages or pressure transducers are anticipated to be less than significant.

The conversion of irrigation systems with existing drip line infrastructure to a low flow emitter system would have no associated environmental impacts. Conversion would consist of adding an additional row of drip tubing to each vine for frost protection. The low flow emitter systems likely will use the same water pressure and source as an existing drip irrigation system. The environmental impacts from the conversion of irrigation systems to low flow emitters are anticipated to be less than significant.

6.9 Other Potential Actions Identified in the Notice of Preparation, But Considered Not Likely to be Implemented

The following actions were identified in the Notice of Preparation as possible actions affected parties may take in response to the proposed regulation, but further analysis has shown these actions are not likely to be implemented. These actions are the use of non-ice nucleating bacteria, copper compounds, helicopters, recycled water, crop conversion, and land conversion.

Use of non-ice nucleating bacteria and copper compounds are not reasonably foreseeable methods of compliance because current scientific data and limited documentation of successful applications from growers do not provide enough feasible data to support these frost protection methods. A publication by the Food and Agriculture Organization (FAO) states that the use of chemical sprays (e.g. zinc, copper, antitranspirants) was reported to offer no measureable benefit in limited scientific investigations of their potential use for frost protection. Likewise, sprays to eliminate ice nucleating bacteria have not been found to be an effective frost protection method because of the great abundance of natural ice nucleating materials in the bark, stems, etc. (FAO, 2005). Further research and development is needed before the use of non-ice nucleating bacteria and chemical sprays can be considered feasible methods of compliance with the proposed regulation.

Agriculture irrigation is a current use of recycled water, and tertiary treated recycled water could be used for frost protection in a closed system that did not allow runoff from the application site. The Sonoma County Water Agency proposed the North

Sonoma County Agricultural Reuse Project to provide recycled water to 21,100 acres of agricultural land. The project included the construction and development of storage and delivery systems. A feasibility study and final Environmental Impact Report was released in 2009. However, at the Sonoma County Board Meeting on May 12, 2009, the program was shelved until funding obstacles were removed, firmer commitments were made from water suppliers, and users have been clearly identified (SCWA 2009). Mendocino County does not have the funding or distribution system in place to deliver recycled water to vineyards for frost protection use (RRFCP, 2009). The costs for setting up the infrastructure to supply recycled water to individually owned vineyards for intermittent use three months out of the year may outweigh any benefits of recycled water use. Due to lack of progress in developing recycled water as an alternative water supply for agricultural use within the project area, use of recycled water for frost protection is not a viable alternative at this time.

Helicopters have been successfully used for frost protection. However, they were not considered a feasible method of compliance due to the high costs of hiring a helicopter ($500/hr, minimum) for frost control and standby charges. Since use of helicopters is effective only in the same frost conditions needed for wind machines, the more cost effective approach would be to install and operate wind machines (Domoto 2006).

Land conversion was not considered a feasible method of compliance. The proposed regulation does not restrict operations or financially impact the vineyard or orchard owner at a significant enough level to assume that an owner would forfeit the agriculture business and explore other land use alternatives. The proposed regulation allows adaptive management as an avenue for taking corrective actions to solve any identified problems. This allows for a business to comply with the regulation at the least cost, therefore it is highly unlikely that land conversion would occur.

Table 4-15 of the economic analysis (appendix D) identified 159 acres that could be taken out of current vineyard or orchard production due to the costs of complying with the proposed regulation. The economic analysis did not address the possibility that this acreage could be converted to more frost tolerant grape varietals or other frost tolerant crops. The acreage that would most likely be taken out of vineyard or orchard production would likely be vineyards and orchards that are currently operating on a marginal value of production due to size or quality of product. If acreage was converted to other crops in response to the costs of complying with the proposed regulation, there might be a small reduction in overall production value due to a change in commodities, but the reduction in value is not expected to result in land conversion to uses other than agriculture. Therefore, any crop conversion that may occur in response to the economic costs of the proposed regulation is not anticipated to reduce long term productivity or the available amount of acreage of irrigable farmland in the project area and is expected to result in less than significant environmental impacts to agricultural resources.

6.10 Comparison of Alternatives

The State Water Board's objective for the project is to establish a regulation that will prevent salmonid stranding mortality while minimizing the impacts of the regulation on the use of water for purposes of frost protection. In support of this objective, the State Water Board's goals are to (a) promote local development and governance of programs that prevent stranding mortality during the frost season, (b) provide transparency of diversion and stream stage monitoring data, (c) ensure that the State Water Board can require any changes to WDMP's that are necessary to ensure that WDMP's are successful and implemented on a timely basis, (d) provide for State Water Board enforcement against non-compliance, and (e) develop a comprehensive regulation that includes all diverters of water for frost protection use, including diverters who pump groundwater that is hydraulically connected to the stream system.

Generally speaking, alternatives to the proposed regulation that are less restrictive on diversions of water for frost protection use have a lower chance of causing significant changes to environmental resources than alternatives that are more restrictive. At the same time, alternatives that are less restrictive on diversions of water for frost protection use are less likely to meet the project objective of preventing salmonid stranding mortality due to frost diversions.

The following sections evaluate the potential future environmental impacts of each alternative and how successfully each alternative meets the objective of the proposed project.

6.10.1 No-Project Alternative – Alternative 1

Under the No-Project Alternative, the State Water Board would not adopt a regulation that will prevent salmonid stranding mortality while minimizing the impacts of the regulation on water supplies for frost protection use. This alternative would not cause any significant changes or significant environmental impacts to offstream environmental resources and diverters would continue to employ their current frost protection methods. However, this alternative would not meet the project objective of preventing stranding mortality as a result of high instantaneous demand from cumulative water diversions for frost protection use.

Some diverters in the watershed have voluntarily implemented best management practices (BMPs) to reduce the potential for salmonid stranding mortality, but a sizable portion of the diverters have not proactively implemented modifications to their water diversion practices to minimize the risk of salmonid stranding mortality. Under this alternative, this trend would likely continue and implementation of BMPs would not happen until after a significant impact occurred, enforcement measures were taken by the State Water Board, NMFS, or DFG, or the State Water Board conducted an adjudicative proceeding or proceedings. In the interim, cumulative

diversions for frost protection would continue to put salmonid populations at risk for stranding mortality.

The No-Project alternative does not adequately meet the objective of the proposed project. This alternative does not encourage or require participation in the development of comprehensive local programs to prevent stranding mortality during the frost season. The alternative does not contain provisions for transparency or streamflow and water diversion monitoring. It also does not provide guidance regarding the manner in which water may be diverted that prevents salmonid stranding mortality. This alternative does not provide a way for diverters to know when or how much water they can divert without causing salmonid stranding mortality.

Under the No-Project Alternative, if stranding mortality occurs, the State Water Board could conduct an adjudicative proceeding or proceedings against individual agricultural diverters in the Russian River watershed to determine whether their diversion and use of water for purposes of frost protection is reasonable. (See Cal. Code Regs., tit. 23, §§ 855-860.) In light of the cumulative nature of the problem, however, conducting an adjudicative proceeding or proceedings for individual diversions would not be the most effective regulatory mechanism for addressing the cumulative impacts of numerous diversions. Because ~~the impacts to~~ salmonid~~s~~ stranding mortality can result from ~~are~~ cumulative frost diversions, it would be difficult to determine whether the practices of an individual diverter are reasonable without taking into consideration the practices of other diverters, and the relative water right priorities of the diverters. Accordingly, a complex, multi-party adjudicative proceeding likely would be required, which would be time-consuming and expensive for the frost diverters as well as the State Water Board. Judging from the number of water right holders in the watershed, such a proceeding could include hundreds of frost diverters, and could take several years. This would ultimately meet the objective of the project, but would be more time consuming and costly for the frost diverters and the State Water Board than the proposed regulation. In the interim, this alternative would fail to fully meet the objective of preventing stranding mortality due to frost diversions.

6.10.2 Local Stakeholder Voluntary Programs – Alternative 2

Under the Local Stakeholder Voluntary Programs alternative the State Water Board would support the development of local stakeholder programs that would reduce the instantaneous demand of water for frost protection and study and monitor the impacts of frost diversions on stream flow. The State Water Board would encourage diverters to participate in a local program and develop guidelines for diverters who choose not to participate in the local program.

Local stakeholder programs would have voluntary participation. Full participation in the program would be difficult to achieve, and it may be difficult to convince program participants to implement recommended BMPs. The number of persons moving to alternative methods of frost protection would therefore be less than the number that

may implement alternative methods under the proposed regulation. As a result, the potentially significant environmental impacts for alternative methods of frost protection, such as groundwater extraction and use, construction of offstream storage, installation of wind machines, and installation of heaters would be less than the impacts that may occur as a result of the proposed regulation.

Monitoring plans for voluntary programs currently under development do not propose monitoring over the entire area where there is potential for diversions for frost protection to cause salmonid stranding mortality. This type of program would not prevent salmonid stranding mortality in the tributaries that would not be directly monitored. In addition, these programs propose limited transparency of data and exchange of information with public agencies. These aspects are inconsistent with the project goals.

Under this alternative, salmonid mortality and population decline due to stranding could continue to occur. It is not possible to reliably coordinate diversions to avoid salmonid stranding mortality if all diverters who may have a cumulative impact on that stream are not part of the program. There may be significant diverters who would not participate without a more universally applicable incentive mechanism, such as the proposed regulation. Without a coordinated program with comprehensive participation, diverters will not know when or how much water they can divert without causing salmonid stranding mortality. This alternative does not provide adequate protection against stranding mortality of salmonids, especially during a dry year, because there may not be enough water to meet all diversion needs during a dry year. Under this alternative, cumulative impacts of diversions for frost protection would likely continue to significantly impact salmonid populations.

In summary, this alternative would have less incidental environmental impacts than the proposed regulation, but this alternative does not adequately meet the objective of the proposed project. Although the local stakeholder proposals submitted to the State Water Board were detailed, none of the proposals fully met the objective and goals of the proposed project. The content of the proposals demonstrate the diversity of approaches that local groups could implement without clear direction from state and federal agencies. However, none of the programs could ensure full participation, and some programs did not provide transparency of information with public agencies. Reliance on voluntary participation is not enough to ensure all frost irrigators will work to reduce their cumulative instantaneous demand. The monitoring components of the programs would not be sufficient to prevent salmonid stranding mortality, particularly on the tributaries. In addition, local stakeholder programs are not equipped to take enforcement action should salmonid stranding and mortality occur.

6.10.3 Adopt a Regulation Similar to the Sonoma County Vineyard and Frost Protection Ordinance – Alternative 3

Under this alternative, the State Water Board would consider adopting a regulation similar to the Sonoma County Vineyard and Orchard Frost Protection Ordinance that

was adopted by the Sonoma County Board of Supervisors on December 14, 2010. The ordinance establishes a registration program and requires all owners of vineyard and orchard frost protection systems in the Russian River watershed within Sonoma County to participate in a comprehensive monitoring program.

The registration and inventory component would not have any significant environmental impacts. The stream stage monitoring program could have impacts similar to those identified in section 6.6, Effects of Installing Stream Stage Gages. As described in section 6.6, installation of pressure transducer data loggers and satellite-based pressure transducer sensors is not anticipated to result in significant environmental effects. However, if USGS gages are installed, the environmental impacts associated with their installation and the number of installations are anticipated to be the same as those identified in section 6.6.

The comprehensive monitoring program could have significant environmental impacts. The level of impacts is dependent on how the final monitoring program is implemented. The draft Sonoma County, Russian River Stream System Frost Monitoring Program Scoping Document indicates that the program would be conducted by a panel of scientist (ISRP) who would provide technical guidance to the Counties, grower groups, and resource agencies on the stream flow monitoring study design and provides interpretation of stream flow monitoring data relative to an assessment of hydrologic impacts from frost protection activities on salmonids. The ISRP would actively identify any problem areas that might occur and work with the identified property owner to mitigate a potentially harmful use of water for frost protection. Mitigation measures, in the form of BMPs, would focus on reducing the instantaneous demand of water for frost protection.

The potential acreage that may require BMPs would likely be comparable to that identified in table 6-2. The BMPs that could be implemented would likely be similar to the potential actions that could be taken in response to the proposed regulation described in sections 6.2, 6.3, 6.4, 6.5, and 6.7. The ISRP may recommend BMPs to a diverter, but, under this alternative, implementation of BMPs is voluntary. Since implementation of BMPs is voluntary, less acreage would be subject to environmental impacts than those listed in table 6.1. The overall environmental impacts of this alternative would depend on the level of voluntary implementation and are anticipated to be less than those identified for the proposed regulation.

This alternative would have fewer environmental impacts than the proposed regulation because implementation of BMPs is voluntary. The alternative would likely be more effective in preventing ~~impacts to salmonids~~salmonid stranding mortality than the local stakeholder approach because registration with the program and installation of stream stage gages is mandatory, but this alternative fails to fully meet the project objective. This alternative does not include specific details of a monitoring program and does not set firm timelines for developing and implementing the monitoring program. Therefore, the alternative does not currently provide adequate stream or diversion monitoring. In addition, any monitoring program that is

developed may not be adequate if it does not provide for transparency of records. This alternative also does not require implementation of BMPs if ~~a risk of harm to salmonids~~the potential for frost diversions to cause stranding mortality is identified on any stream. Without the knowledge of the quantity and timing of frost diversions, a stream monitoring program, and a mandatory corrective action program, there is no guarantee that an alternative similar to the Sonoma County Ordinance will do enough to fully meet the objective and goals of the proposed project.

6.10.4 Adopt a Regulation Similar to California Code of Regulations, Title 23, Section 735 – Alternative 4

As an alternative to the proposed regulation, the State Water Board could adopt a regulation similar to the previously adopted regulation regarding diversions for frost protection use in the Napa River watershed. Under California Code of Regulations, title 23, section 735, all diversions of water from the Napa River stream system between March 15 and May 15 determined to be significant by the State Water Board or a court of competent jurisdiction shall be considered unreasonable and a violation of Water Code Section 100 unless controlled by a watermaster administering a Board or court approved distribution program. Diversions for frost protection and irrigation during this period are restricted to: (1) replenishment of reservoirs filled prior to March 15 under an appropriative water right permit, or (2) diversions permitted by the court.

This alternative could have significant environmental impacts. The alternative would establish that all significant direct diversions of surface water for purposes of frost protection are unreasonable unless controlled by a watermaster administering an approved distribution system. This would not necessarily allow diverters to coordinate the instantaneous rate of diversions to maintain stream stage levels that are protective of salmonids. The alternative would result in direct diverters changing frost protection methods to those identified for the proposed project in sections 6.2, 6.3, 6.4, 6.5, and 6.7. The potential acreage affected would likely be comparable to that identified in table 6-2.

This alternative would be successful in ~~protecting salmonids from harm~~preventing cumulative diversions for frost protection from causing a reduction in stream stage that causes stranding mortality. However, this alternative is less likely to meet one of aspect of the project objective, which is to minimize the impact of the regulation on the use of water for purposes of frost protection by allowing diverters an opportunity to address and mitigate their impacts at a local level through managing diversions and implementing BMPs. The proposed regulation is more flexible in that it allows for the determination of stream stage ~~needed to protect salmonids~~that should be maintained at each gage to prevent stranding mortality during the frost season, and allows for a suite of different frost protection methods and BMPS that can be tailored to the individual diverter's needs while working to prevent ~~harm to salmonids~~salmonid stranding mortality.

6.10.5 Adopt a Regulation That Requires Real-Time Diversion Monitoring and Reporting – Alternative 5

This alternative would be the same as the proposed regulation, except that real-time monitoring and reporting of frost diversions on an hourly basis also would be required.

This alternative would be the most effective in terms of ensuring fast response to situations in which salmonids are at risk for mortality due to stranding. The purpose of requiring hourly reporting of diversion data to the governing body is to allow the governing body to provide timely input to the growers and warn them of the potential risk of exceeding minimum stage levels. This information may be used by growers to adjust diversions, restore stream stage, and ~~protect salmonids~~prevent salmonid stranding mortality as soon as the risk is identified.

This alternative would have similar environmental impacts as those identified above for the proposed regulation, but it has a much larger economic impact. Requiring real-time monitoring and reporting of frost diversions significantly increases the costs to all diverters. In some locations, where other frost protection methods are not viable, this increase in cost might result in a significantly higher loss of production value for vineyards and orchards compared to the proposed regulation. This could potentially lead to significant decreases in yield due to crops lost to frost and result in land fallowing and land conversion. This alternative would have a more significant impact to agricultural resources than the proposed regulation.

Even though this alternative may be the most effective in fulfilling the objective of preventing ~~harm to salmonids~~salmonid stranding mortality by providing for immediate response and corrective action in situations of potential salmonid mortality, this alternative does not consider that there may be streams in which the risk to salmonids is low. It may be unreasonable to require all frost diverters to install real-time diversion monitoring, especially on streams where salmonid stranding is not likely to occur. Accordingly, this alternative is less likely to meet one of aspect of the project objective, which is to minimize the impact of the regulation on the use of water for purposes of frost protection.

6.10.6 Environmentally Superior Alternative

From a CEQA standpoint, the environmentally superior alternative is the no-project alternative. Among the remaining alternatives, the environmentally superior alternative is the local stakeholder voluntary programs (Alternative 2). Neither of these two alternatives, however, fully meets the basic project objective of preventing salmonid stranding mortality.

7 SUMMARY OF IMPACTS AND DESCRIPTION OF POTENTIAL MITIGATION MEASURES

For purposes of CEQA, the project is adoption of the Frost Protection Regulation for the Russian River Watershed. The proposed regulation itself will not approve any particular actions that may be proposed in response to the regulation. Moreover, in general the proposed regulation will operate to protect the environment by ensuring that water diversion for frost protection use will be managed in a manner that prevents salmonid stranding mortality.

7.1 Summary of Impacts

Significant impacts may arise out of actions that may be taken by affected persons in attempting to either comply with the regulation or avoid the need to comply with the regulation. These impacts could be direct, which are environmental impacts caused by actions that are required by the proposed regulation; or indirect, which are environmental impacts caused by actions that affected persons may take in response to the proposed regulation. An indirect physical change in the environment is a physical change which is not immediately related to adoption of the regulation, but which may occur as a result of the regulation being adopted.

The actions that affected persons may take to comply with the regulation include:

- installing hydraulically connected groundwater extraction wells and increasing hydraulically connected groundwater use;
- constructing new and expanding existing offstream storage facilities and increased diversion of water to storage,
- removal or alteration of existing surface water diversion facilities,
- installing and operating wind machines,
- installing and operating orchard heaters;
- installing and operating USGS stream gages,
- installing and operating non-USGS stream gages;
- installing and operating diversion monitoring devices;
- installing and operating low flow emitters, and
- any combination of above actions.

The actions that affected persons may take to avoid the need to comply with the regulation include:

- removal or alteration of existing surface water diversion facilities,
- installing non-hydraulically connected groundwater extraction wells and increasing non-hydraulically connected groundwater use,
- installing and operating wind machines with no reliance on water diversion,

- installing and operating orchard heaters with no reliance on water diversion, and
- any combination of above actions.

Implementation of the regulation is anticipated to result in direct impacts from the installation and operation of non-USGS stream gages; however those impacts are anticipated to be less than significant.

Less than significant indirect impacts are anticipated to result from the following potential actions that may be taken in response to the proposed regulation: installation and operation of diversion monitoring devices, and installation and operation of low-flow emitters.

Potentially significant direct and indirect impacts may result from other potential actions that may be taken in response to the proposed regulation. These potential actions are summarized in Table 7-1, including the significance levels determined for each environmental issue area. In many cases, the significance of the impacts resulting from these actions by third parties will depend on the timing, specific components, site-specific location, and other characteristics of the project-specific actions being proposed.

It is impossible to predict which affected parties will take any of the actions described below, or exactly how many affected parties will take any of those actions. Accordingly, environmental impacts were evaluated at a programmatic level. A programmatic level analysis is more general in nature and evaluates the effects on the environment at a broad level. This type of analysis is appropriate when analyzing the potential impacts associated with adopting a program, policy, or regulation.

~~Future CEQA reviews~~For individual projects subject to CEQA, future environmental reviews conducted by the State Water Board or by another lead agency can be expected to identify any significant project-specific environmental effects and mitigate them to less-than-significant levels. In addition, other regulatory mechanisms can be expected to provide opportunities for minimizing and avoiding significant environmental effects. For instance, the State Water Board anticipates that the proposed regulation may result in increased numbers of water right applications and petitions for constructing new and expanding existing offstream storage facilities. Terms and conditions can be added as needed to water right permits issued by the State Water Board to ensure that the specific projects are carried out in ways that avoid or minimize the potential significant environmental effects. Projects that are subject to ministerial permits or otherwise exempt from CEQA may be required to implement any applicable requirements but would not be subject to project-specific analysis and mitigation under CEQA.

Examples of public agencies that could serve as the CEQA lead agency for subsequent environmental reviews of actions requiring CEQA review proposed by persons in response to implementation of the regulation include:

- State Water Board,
- Local municipalities and county governments,
- Special districts with discretionary approval authority,
- California Department of Fish and Game,
- California Regional Water Quality Control Board - North Coast Region,
- California Department of Parks and Recreation, and
- California Coastal Commission.

Table 7-1. Summary of Significance Determinations by Potential Action and Resources Areas						
ENVIRONMENTAL ISSUE AREA	**POTENTIAL ACTION BY AFFECTED PARTY**					
	INCREASED GROUNDWATER EXTRACTION AND USE	**CONSTRUCTION OF NEW AND EXPANSION OF EXISTING OFFSTREAM STORAGE**	**REMOVAL OR MODIFICATION OF ~~DIVERSION DAMS~~SURFACE WATER DIVERSION STRUCTURES**	**INSTALLATION AND OPERATION OF WIND MACHINES**	**INSTALLATION AND OPERATION OF ORCHARD HEATERS**	**INSTALLATION AND OPERATIONS OF USGS RATED STREAM GAGES**
Aesthetics	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Not Significant	Not Significant
Agricultural Resources	Potentially Significant	Potentially Significant	Not Significant	Not Significant	Not Significant	Not Significant
Air Quality	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Not Significant
Biological Resources	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Not Significant	Potentially Significant
Cultural Resources	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Not Significant
Geology/Soils	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Not Significant	Not Significant
Hazards & Hazardous Materials	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Not Significant
Hydrology/ Water Quality	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Not Significant	Potentially Significant
Land Use/Planning	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Not Significant
Mineral Resources	Not Significant	Potentially Significant	Not Significant	Not Significant	Not Significant	Not Significant
Noise	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Not Significant	Not Significant
Population/Housing	Not Significant	Not Significant	Not significant	Not Significant	Not Significant	Not Significant
Public Services	Not Significant	Not significant	Not significant	Not Significant	Not Significant	Not Significant
Recreation	Potentially Significant	Not significant	Potentially Significant	Not Significant	Not Significant	Not Significant
Transportation/ Traffic	Potentially Significant	Potentially Significant	Not significant	Potentially Significant	Not Significant	Not Significant
Utilities/ Service Systems	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Not Significant

7.2 Potential Mitigation Measures

The following paragraphs examine examples of potentially significant impacts of the proposed regulation and the regulatory requirements and mitigation measures for these impacts that may be incorporated at a project-specific level. These regulatory requirements and mitigation measures are likely to reduce many, but not all, of the potential impacts of the proposed regulation to less than significant levels. Some indirect impacts may not be identified or mitigated because it is impossible to predict who will take action in response to the proposed regulation, or what action they will take. In some cases, it may not be feasible to fully mitigate for the indirect impacts of the proposed regulation. For example, it may not be possible to fully mitigate for the loss of wetland habitat as a result of expanding offstream storage

7.2.1 Potential Action: Increased groundwater extraction and use

In response to the regulation, there could be an increase in pumping of hydraulically connected or non-hydraulically connected groundwater if water users choose to utilize groundwater for frost protection use. The construction of new wells could cause construction-related impacts. In addition, increased groundwater use could reduce both groundwater levels and surface water flows. To the extent that surface water diverters switch to groundwater pumping in accordance with a corrective action plan developed as part of an approved water demand management program, the impact of their diversions on instream flows should be reduced. To the extent that is not the case, the State Water Board could require changes to the corrective action plan, or exercise the regulatory authority described below. The potential increase in pumping of hydraulically connected and non-hydraulically connected groundwater have similar regulatory framework and potential mitigation measures.

Regulatory Framework

The State Water Board has the authority under article X, section 2 of the California Constitution and Water Code section 100 to prevent the waste or unreasonable use, the unreasonable method of use, or the unreasonable method of diversion of all water resources of the state. The constitutional doctrine of reasonable use applies to the diversion and use of both surface and groundwater, and it applies irrespective of the type of water right held by the diverter or user. (*Peabody v. Vallejo* (1935) 2 Cal.2d 351, 366-367.) Water Code section 275 directs the State Water Board to take all appropriate proceedings or actions to prevent waste or violations of the reasonable use standard. Thus, the State Water Board has authority to regulate water use in accordance with article X, section 2 of the Constitution. (See *Imperial Irrigation District v. State Water Resources Control Board* (1986) 186 Cal.App.3d 1160 [231 Cal.Rptr. 283] [holding that jurisdiction extends to pre-1914 rights].)

The California Constitution also declares that the general welfare requires that the State's water resources be put to beneficial use to the fullest extent to which they are capable. (Cal. Const., art. X, § 2.) Therefore, in determining the

reasonableness of a particular use of water or method of diversion, other competing water demands and beneficial uses of water must be considered. A particular water use or method of diversion may be determined to be unreasonable based on its impact on fish, wildlife, or other instream beneficial uses. (*Environmental Defense Fund, Inc. v. East Bay Municipal Utility District* (1980) 26 Cal.3d 183.) What constitutes a reasonable water use depends on the facts and circumstances of each case. (People ex rel. State Water Resources Control Board v. Forni (1976) 54 Cal.App.3d 743, 750.)

The State Water Board also has an affirmative duty to protect, where feasible, the State's public trust resources. (*National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 446.) The purpose of the public trust doctrine is to protect navigation, fishing, recreation, environmental values, and fish and wildlife habitat. Under the public trust doctrine, the State retains supervisory control over the navigable waters of the state and the lands underlying those waters. (*Id*. at p. 445.) In applying the public trust doctrine, the State Water Board has the power to reconsider past water allocations even if the Board considered public trust impacts in its original water allocation decision. Thus, the State Water Board may exercise its authority under the doctrines of reasonable use and the public trust to address reduced instream flows in the project area and adverse effects to fish, wildlife, or other instream beneficial uses due to the pumping of groundwater.

Pursuant to Water Code 1200, the State Water Board also has permitting authority over subterranean streams flowing in known and definite channels. When considering an appropriation of groundwater, the State Water Board may have to evaluate the legal classification of the groundwater and determine whether it is a subterranean stream subject to the State Water Board's permitting authority.

The two counties in the project area also may mitigate the potential impacts of increased groundwater pumping by regulating groundwater use pursuant to their police powers.

Sonoma County Water Agency has implemented a non-regulatory Sonoma Valley Groundwater Management Plan. The Plan, implemented by Sonoma County Water Agency in 2007, identifies a range of water management actions to sustain resources for future generations. The goal of the Plan is to locally manage, protect, and enhance groundwater resources for all beneficial uses, in a sustainable, environmentally sound, economical, and equitable manner. The Plan contains basin management objectives; groundwater availability forecasts developed through modeling; actions to attain groundwater sustainability, including increased use of recycled water to offset groundwater pumping, increased conservation, groundwater monitoring, integration of water management planning on a regional scale, and stakeholder involvement; and plan implementation through a collaborative process.

Construction activities for installing groundwater pumps in response to the proposed regulation would result in greenhouse gas emissions from construction equipment

exhaust and vehicle trips. If existing surface water diverters switch to groundwater pumping, depending on the type of groundwater pump installed, operational greenhouse gas emissions may be reduced relative to existing conditions. However, in the absence of project-specific information, it is difficult to determine which type of groundwater pump would be used, or the number, type, and frequency of construction equipment that would be used. The California Attorney General's office issued a report titled "The California Environmental Quality Act: Addressing Global Warming at the Local Agency Level" that identifies various measures that could be implemented to reduce greenhouse gas emissions at the project level, including the requirement to use best management practices in agriculture to reduce greenhouse gas emissions. The Bay Area Air Quality Management District's (BAAQMD) Air Quality Guidelines, updated May 2011, recommends that lead agencies quantify greenhouse gas emissions resulting from new development and apply all feasible mitigation measures to lessen the potentially significant adverse impacts. It recommends CEQA thresholds of significance that would limit greenhouse gas emissions from stationary sources to 10,000 metric tons of CO2/yr. This threshold is an interim threshold which will be reevaluated when the Air Resources Board more fully develops and implements other mitigation measures such as cap and trade programs. For non-stationary sources, the BAAQMD recommends greenhouse gas emissions be limited to 1,100 metric tons of CO2 per year, or compliance with a Qualified Greenhouse Gas Reduction Strategy. Mendocino County Air Quality Management District recommends, with some exceptions, that the BAAMQCD's Air Quality Guidelines be used.

Depending on the nature of the groundwater extraction project implemented by affected persons in response to the regulation, significant impacts may occur in other issue areas, as shown in Table 7-1. ~~Future CEQA reviews~~For individual projects subject to CEQA, future environmental reviews conducted by the State Water Board or by another lead agency can be expected to identify any significant project-specific environmental effects in these issue areas and mitigate them to less-than-significant-levels. For instance, the lead agency would be required to assess whether the project will have an adverse impact on surface and subsurface historical resources within the area of project effect and if so to mitigate that effect. To adequately assess and mitigate project-related impacts to archaeological resources, the lead agency would work with the Native American Heritage Commission and Native American contacts to develop appropriate mitigation measures. In addition, other regulatory mechanisms may provide opportunities for minimizing and avoiding significant environmental effects.

Mitigation Measure GW-MM-1

Groundwater pumpers shall comply with any mitigation measures imposed by state and local agencies to mitigate potentially significant impacts associated with actions taken in response to the regulation. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state or local agency.

Mitigation Measure GW-MM-2

Groundwater pumpers will comply with any mitigation measures imposed by local agencies to mitigate potentially significant impacts to groundwater supplies due to actions taken in response to the proposed regulation. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate county agency, depending on the nature and availability of groundwater in the area.

Mitigation Measure GW-MM-3

Pumpers of groundwater from a subterranean stream shall comply with the State Water Board's water right permitting authority, including the filing of an application to divert water or a petition to modify points of diversion, place of use or purpose of use. The State Water Board will condition its approval of any applications or petitions to ensure that the diversion and use of water under the permit in question will not unreasonably affect fish, wildlife, or other instream beneficial uses. Permittees shall comply with all provisions of the water right permit or license issued.

Mitigation Measure GW-MM-4

The State Water Board may exercise its authority under the doctrine of reasonable use to mitigate potentially significant impacts to groundwater levels or instream flows that may result from the increased pumping of groundwater. The State Water Board may exercise this authority through adjudicative proceedings to determine whether the pumping and use of groundwater for purposes of frost protection are reasonable.

Mitigation Measure GW-MM-5

Groundwater pumpers will comply with any mitigation measures imposed by state and local agencies to mitigate potentially significant impacts from greenhouse gas emissions due to construction or long-term activities taken in response to the proposed regulation. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state and local agencies.

7.2.2 Potential Action: Construction of new, or expanding existing offstream storage facilities

In response to the regulation, persons may choose to construct new, or expand existing, offstream storage facilities. These construction activities may result in temporary impacts to air quality, sedimentation, erosion, and non-visible water quality parameters. In addition, diverters who switch from directly diverting to diverting to storage may change the timing of their diversions, which could reduce winter instream flows before or after frost events.

Regulatory Framework

The Basin Plan for the North Coast Regional Water Quality Control Board (NCRWQCB) contains numeric and narrative water quality objectives designed to protect the beneficial uses of surface waters. If the construction of a new, or expansion of an existing, offstream storage facility would result in the discharge of waste to waters of the State, the discharger must file a report of waste discharge with the NCWRQCB and obtain a waste discharge requirement (WDR). (Wat. Code, § 13260.) The WDR must implement the Basin Plan and protect the beneficial uses of the receiving waters.

Another regulatory tool that may mitigate the water quality impacts of construction activities is the NCRWQCB's Sediment TMDL Implementation Policy. The Sediment TMDL Implementation Policy states that Regional Water Board staff shall control sediment pollution by using existing permitting and enforcement tools, including individual NPDES permits and coverage under the general construction stormwater permit. The goals of the TMDL Implementation Policy are to control sediment waste discharges to impaired water bodies so that the TMDLs are met, sediment water quality objectives are attained, and beneficial uses are no longer adversely affected by sediment.

As indicated in the TMDL Implementation Policy, certain construction activities may be covered under the General Permit for Discharges of Storm Water Associated with Construction Activity adopted by the State Water Board. Covered activities may include grading and excavation of reservoir facilities and pump and piping replacement. Under the general permit, construction Best Management Practices (BMPs) such as silt fencing, straw waddles, and other erosion BMPs can be used to contain stormwater runoff and reduce erosion potential. Pursuant to the State Water Board's General Construction Permit, for any construction involving disturbance of 1 acre ~~of~~ or more, a Stormwater Pollution and Prevention Plan (SWPPP) would need to be prepared.

Potential mitigation for water quality impacts due to construction of new, or expansion of existing, off stream storage facilities may also involve Water Quality Certifications from the State or Regional Water Quality Control Board. Water quality certification requirements would apply to anyone proposing to conduct a dredge or fill project that requires a federal permit and may result in a discharge to waters of the United States, including wetlands, year round and seasonal streams, lakes and other surface waters. A Clean Water Act (CWA) Section 401 Water Quality Certification is a finding from the State or Regional Water Quality Control Board that the proposed project will comply with CWA Sections 301, 302, 303, 306 and 307, the NCRWQCB Basin Plan, and other appropriate provisions of State law.

Projects having a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool,

coastal, etc.) either individually or in combination with the known or probable impacts of other activities through direct removal, filling, hydrological interruption, or other means may need to obtain a permit from the United States Army Corps of Engineers (USACE). If the project will require disturbance of a wetland and the USACE determines that the wetland is not subject to regulation under Section 404 of the CWA, Section 401 water quality certification is not required. However, the Regional Water Board may require WDRs if fill material is placed into waters of the state. If all wetlands cannot be avoided as part of the project, the applicant will be required to file an application for WDRs with the Regional Water Board.

The California Department of Fish and Game (DFG) is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. Fish and Game Code section 1602 requires DFG to be notified regarding any proposed activity that may substantially modify a river, stream, or lake. Persons proposing to construct new, or expand existing, off-stream storage facilities should notify the DFG if the activity will:

- substantially divert or obstruct the natural flow of any river, stream or lake;
- substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake; or
- deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

If DFG determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement would be prepared. Conditions that DFG may require include, but are not limited to, avoidance or minimization of vegetation removal, use of standard erosion control measures, limitations on the use of heavy equipment, limitations on work periods to avoid impacts on fisheries and wildlife resources, minimum bypass flow requirements, and requirements to restore degraded sites or compensate for permanent habitat losses. The Agreement would include reasonable conditions necessary to protect those resources and must comply with the California Environmental Quality Act (CEQA).

Potentially significant air quality impacts associated with construction of new, or expansion of existing, offstream storage facilities are limited to those resulting from short-term construction activities. Construction-related emissions could include exhaust from construction equipment and fugitive dust from land clearing, earthmoving, movement of vehicles, and wind erosion of exposed soil during reservoir construction or removal. The Bay Area Air Quality Management District (BAAQMD), the Northern Sonoma County Air Pollution Control District (NSCAPCD), and the Mendocino County Air Quality Management District are the regional agencies responsible for regulating sources of air pollution in the project area. The BAAQMD has jurisdiction over the southern portion of Sonoma County, while the NSCAPCD has jurisdiction over Sonoma County coastal areas, north of Windsor, and along the Russian River.

In addition to the regulatory framework described above, the seasonal storage of surface water in most new or expanded offstream storage facilities will require a new or amended water right permit from the State Water Board. Unless an exemption applies, the State Water Board's review of water right applications is subject to CEQA. In addition, in acting on water right applications and petitions, the State Water Board must take into consideration potential impacts to fish, wildlife, and other instream beneficial uses, the public interest and the applicable Basin Plan. (Wat. Code, §§ 1253, 1255, 1257, 1258.) Accordingly, the State Water Board will have the opportunity to identify and mitigate the impacts of constructing new, or expanding existing, offstream storage reservoirs as part of the State Water Board's review of individual water right applications and petitions. Similarly, the State Water Board will have the opportunity to ensure that applicants and petitioners comply with any other applicable regulatory requirements, including the North Coast Instream Flow Policy.

Construction activities for new, or expanding existing offstream storage facilities in response to the proposed regulation would result in greenhouse gas emissions from construction equipment exhaust, and vehicle trips. If existing direct diverters switch to offstream reservoirs, depending on the type of diversion pump installed, operational greenhouse gas emissions may be reduced relative to existing conditions. However, in the absence of project-specific information, it is difficult to determine which type of diversion pump would be used, or the number, type, and frequency of construction equipment that would be used. The California Attorney General's office issued a report titled "The California Environmental Quality Act: Addressing Global Warming at the Local Agency Level that identifies various measures that could be implemented to reduce greenhouse gas emissions at the project level, including the requirement to use best management practices in agriculture to reduce greenhouse gas emissions. The Bay Area Air Quality Management District's (BAAQMD) Air Quality Guidelines, updated May 2011, recommends that lead agencies quantify greenhouse gas emissions resulting from new development and apply all feasible mitigation measures to lessen the potentially significant adverse impacts. It recommends CEQA thresholds of significance that would limit greenhouse gas emissions from stationary sources to 10,000 metric tons of CO2/yr. This threshold is an interim threshold which will be reevaluated when the Air Resources Board more fully develops and implements other mitigation measures such as cap and trade programs. For non-stationary sources, the BAAQMD recommends greenhouse gas emissions be limited to 1,100 metric tons of CO2 per year, or compliance with a Qualified Greenhouse Gas Reduction Strategy. Mendocino County Air Quality Management District recommends, with some exceptions, that the BAAMQCD's Air Quality Guidelines be used.

Depending on the nature of the offstream reservoir project implemented by affected persons in response to the regulation, significant impacts may occur in other issue areas, as shown in Table 7-1. Future CEQA reviews conducted by the State Water Board or by another lead agency can be expected to identify any significant project-specific environmental effects in these issue areas and mitigate them to less-than-

significant-levels. In addition, other regulatory mechanisms may provide opportunities for minimizing and avoiding significant environmental effects.

Mitigation Measure OFS-MM-1

Diverters will comply with any mitigation measures imposed by state and local agencies to mitigate potentially significant impacts that would be associated with construction or modification of offstream storage reservoirs in response to the regulation. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state or local agency.

Mitigation Measure OFS-MM-2

Diverters will comply with any mitigation measures to preserve water quality, mitigate wetland impacts, or protect fish, wildlife, and native plant resources imposed by the North Coast Regional Water Quality Control Board, US Army Corps of Engineers, or the Department of Fish and Game. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate agency, depending on the severity and nature of the anticipated impacts.

Mitigation Measure OFS-MM-3

Diverters will comply with any mitigation measures imposed by the applicable air district to reduce construction emissions. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate air district, depending on the severity of anticipated construction emissions.

Mitigation Measure OFS-MM-4

Diverters will comply with any mitigation measures imposed by state and local agencies to mitigate potentially significant impacts from greenhouse gas emissions due to construction or use of new or expanded offstream storage reservoirs. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state and local agencies.

Mitigation Measure OFS-MM-5

Inclusion of some or all of the following permit terms, substantially as follows, in new or amended water right permits may reduce potential short-term water quality impacts from storage facility construction activities to less-than-significant levels:

- *To prevent degradation of the quality of water during and after construction of the project, prior to the commencement of construction, Permittee shall file a report pursuant to Water Code section 13260 and shall comply with all waste discharge requirements imposed by the California Regional Water Quality Control Board, North Coast Region, or by the State Water Resources Control Board.*

- *Prior to the diversion of water and construction of the offstream reservoir, Permittee shall obtain coverage from the North Coast Regional Water Quality Control Board under the General Permit for Discharges of Storm Water Associated with Construction Activity prior to conducting any construction activities that disturb more than one acre of soil.*

- *No debris, soil, silt, cement that has not set, oil, or other such foreign substance will be allowed to enter into or be placed where it may be washed by rainfall runoff into the waters of the State. When operations are completed, any excess materials or debris shall be removed from the work area.*

Mitigation Measure OFS-MM-6

Inclusion of the following permit terms, substantially as follows, in new or amended water right permits, may reduce potential short-term impacts to wetlands from storage facility construction activities to less-than-significant levels:

- *Prior to the start of construction, or diversion or use of water under this permit, Permittee shall obtain the appropriate permit from the United States Army Corps of Engineers and file a copy with Division of Water Rights. If a permit from the United States Army Corps of Engineers is not necessary for this permitted project, the Permittee shall provide the Division of Water Rights with a letter from the United States Army Corps of Engineers affirming that a permit is not needed.*

- *If the project requires a permit from United States Army Corps of Engineers, Permittee shall obtain Clean Water Act section 401 Water Quality Certification from the State Water Resources Control Board prior to the start of construction, or diversion or use of water under this permit.*

Mitigation Measure OFS-MM-7

Inclusion of the following permit term, substantially as follows, in new or amended water right permits, may reduce potential impacts to fish and wildlife from reservoir construction activities to less-than-significant levels:

- *No work shall commence and no water shall be diverted, stored or used under this permit until a copy of a stream or lake alteration agreement between the State Department of Fish and Game and the permittee is filed with the Division of Water Rights. Compliance with the terms and conditions of the agreement is the responsibility of the permittee. If a stream or lake agreement is not necessary for this permitted project, the permittee shall provide the Division of Water Rights a copy of a waiver signed by the State Department of Fish and Game.*

Mitigation Measure OFS-MM-8

Inclusion of the following permit term, substantially as follows, in new or amended water right permits, may reduce potential short-term air quality impacts from storage facility construction activities for locations within the southern portion of the Russian River watershed in Sonoma County lying within San Francisco Bay Area Air Quality Management District to less-than-significant levels:

- *Prior to the start of construction, Permittee shall submit a detailed Emission Control and Mitigation Plan to the Deputy Director for Water Rights. Permittee shall also submit a copy of the plan to the San Francisco Bay Area Air Quality Management District. The Emission Control and Mitigation Plan shall be consistent with the San Francisco Bay Area Air Quality Management District's Air Quality Guidelines and include a monitoring and reporting component to ensure that mitigation measures identified in the Emission Control and Mitigation Plan are implemented. Permittee shall provide evidence to verify implementation of measures identified in the Emission Control and Mitigation Plan within 30 days of completion of construction work to the Deputy Director for Water Rights. Permittee shall also provide a copy of the evidence to the San Francisco Bay Area Air Quality Management District upon request. Evidence may consist of, but is not limited to, photographs and construction records.*

Mitigation Measure OFS-MM-9

Inclusion of the following permit term, substantially as follows, in new or amended water right permits, may reduce potential impacts to cultural resources to less-than-significant levels:

- *Should any buried archeological materials be uncovered during project activities, such activities shall cease within 100 feet of the find. Prehistoric archeological indicators include: obsidian and chert flakes and chipped stone tools; bedrock outcrops and boulders with mortar cups; ground stone implements (grinding slabs, mortars and pestles) and locally darkened midden soils containing some of the previously listed items plus fragments of bone and fire affected stones. Historic period site indicators generally include: fragments of glass, ceramic and metal objects; milled and split lumber; and structure and feature remains such as building foundations, privy pits, wells and dumps; and old trails. The Deputy Director for Water Rights shall be notified of the discovery and a professional archeologist shall be retained by the Permittee to evaluate the find and recommend appropriate mitigation measures. Proposed mitigation measures shall be submitted to Deputy Director for Water Rights for approval. Project-related activities shall not resume within 100 feet of the find until all approved mitigation measures*

have been completed to the satisfaction of the Deputy Director for Water Rights.

Mitigation Measure OFS-MM-10

Inclusion of the following permit term, substantially as follows, in new or amended water right permits, may reduce potential impacts to riparian vegetation to less-than-significant levels:

- *For the protection of riparian habitat, Permittee shall establish a setback of number feet along stream name. The stream setback shall be measured from the top of the bank on both sides of the stream. No activity shall occur within the setback area, including, but not limited to, grading, roads, fencing, storage areas, and irrigation, with the exception of access roads. Permittee shall restrict cattle or other domestic stock access to the riparian area. These requirements shall remain in effect as long as water is being diverted under any permit or license issued pursuant to Application NUMBER.*

Mitigation Measure OFS-MM-11

Inclusion of the following permit term, substantially as follows, in new or amended water right permits, may reduce potential impacts to oak woodlands to less-than-significant levels:

- *Permittee shall, for the maintenance of oak woodland, plant three oak trees for every one oak tree removed. Trees may be planted in groves in order to maximize wildlife benefits and shall be native to name County. The tree species and planting scheme shall be approved by the Department of Fish and Game prior to planting. Permittee shall submit to the Chief, Division of Water Rights, a copy of the approved planting scheme.*

  _____ year(s) after completion of the tree planting program, photo documentation showing the trees shall be submitted to the Deputy Director for Water Rights. Permittee shall replace plants as needed to assure a 75% survival rate.

  Permittee shall prepare~~d~~ a long-term wildlife habitat maintenance plan for the re-planted oak woodland in consultation with the Department of Fish and Game; Permittee shall submit a copy of this plan to the Deputy Director for Water Rights. Any changes to this plan must be approved by the Department of Fish and Game; Permittee shall submit a copy of any approved changes to Deputy Director for Water Rights. The re-planted oak woodland shall be maintained as wildlife habitat as long as water is being diverted under any permit or license issued pursuant to Application NUMBER.

7.2.3 Potential Action: Modification or Removal of Surface Water Diversion Structures

In response to the proposed regulation, persons may choose to modify or remove surface water diversion structures. Surface water diversion structures may regulate water in a detention area. These structures are usually used to directly divert surface water for frost protection use. The structures may consist of temporary, earth-filled structures or rock dams that obstruct small tributary streams, or the structures could be permanent, and obstruct the entire width of larger streams. Modification and removal activities may result in temporary impacts to air quality, sedimentation, erosion, and non-visible water quality parameters.

Regulatory Framework

The Basin Plan for the North Coast Regional Water Quality Control Board (NCRWQCB) contains numeric and narrative water quality objectives designed to protect the beneficial uses of surface waters. If the modification or removal of surface water diversion structures would result in the discharge of waste to waters of the State, the discharger must file a report of waste discharge with the (NCRWQCB) and obtain a waste discharge requirement (WDR). (Wat. Code, § 13260.) The WDR must implement the NCRWQCB Basin Plan and protect the beneficial uses of the receiving waters.

Another regulatory tool that may mitigate the water quality impacts of construction activities is the NCRWQCB's Sediment TMDL. The implementation policy of the TMDL states that Regional Water Board staff shall control sediment pollution by using existing permitting and enforcement tools, including individual NPDES permits and coverage under the general construction stormwater permit. The goals of the TMDL Implementation Policy are to control sediment waste discharges to impaired water bodies so that the TMDLs are met, sediment water quality objectives are attained, and beneficial uses are no longer adversely affected by sediment.

As indicated in the TMDL implementation policy, certain construction activities may be covered under the General Permit for Discharges of Storm Water Associated with Construction Activity adopted by the State Water Board. Covered activities may include grading and excavation of gaging station sites and pump and piping replacement. Under the general permit, construction Best Management Practices (BMPs) such as silt fencing, straw waddles, and other erosion BMPs can be used to contain stormwater runoff and reduce erosion potential. Pursuant to the State Water Board's General Construction Permit, for any construction involving disturbance of 1 acre ~~of~~ or more, a Stormwater Pollution and Prevention Plan (SWPPP) would need to be prepared.

Potential mitigation for water quality impacts due to removal or modification of surface water diversion structures may also involve Water Quality Certifications from the NCRWQCB. Water quality certification requirements would apply to anyone

proposing to conduct a dredge or fill project that requires a federal permit and may result in a discharge to waters of the United States, including wetlands, year round and seasonal streams, lakes and other surface waters. A Clean Water Act (CWA) Section 401 Water Quality Certification is a finding from the Regional Water Quality Control Board that the proposed project will comply with CWA Sections 301, 302, 303, 306 and 307, the NCRWQCB Basin Plan, and other appropriate provisions of State law.

Projects having a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) either individually or in combination with the known or probable impacts of other activities through direct removal, filling, hydrological interruption, or other means may need to obtain a permit from the United States Army Corps of Engineers (USACE). If the project will require disturbance of a wetland and the USACE determines that the wetland is not subject to regulation under Section 404 of the CWA, Section 401 water quality certification is not required. However, the NCWRQCB may require WDRs if fill material is placed into waters of the state. If all wetlands cannot be avoided as part of the project, the applicant will be required to file an application for WDRs with the NCWRQCB.

The California Department of Fish and Game (DFG) is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. Fish and Game Code section 1602 requires DFG to be notified regarding any proposed activity that may substantially modify a river, stream, or lake. Persons proposing to remove or modify surface water diversion structures should notify the DFG if the activity will:

- substantially divert or obstruct the natural flow of any river, stream or lake;
- substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake; or
- deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

If DFG determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement would be prepared. Conditions that DFG may require include, but are not limited to, avoidance or minimization of vegetation removal, use of standard erosion control measures, limitations on the use of heavy equipment, limitations on work periods to avoid impacts on fisheries and wildlife resources, and requirements to restore degraded sites or compensate for permanent habitat losses. The Agreement would include reasonable conditions necessary to protect those resources and must comply with the California Environmental Quality Act (CEQA).

Potentially significant air quality impacts associated with modification or removal of surface water diversion structures are limited to those resulting from short-term construction activities. Construction-related emissions could include exhaust from

construction equipment and fugitive dust from land clearing, earthmoving, movement of vehicles, and wind erosion of exposed soil during construction. The San Francisco Bay Area Quality Management District has developed mitigation measures to reduce construction-related emissions.

Construction activities would result in greenhouse gas emissions from construction equipment exhaust, vehicle trips. The California Attorney General's office issued a report titled "The California Environmental Quality Act: Addressing Global Warming at the Local Agency Level" that identifies various measures that could be implemented to reduce greenhouse gas emissions at the project level. The Bay Area Air Quality Management District's (BAAQMD) Air Quality Guidelines, updated May 2011, recommends that lead agencies quantify greenhouse gas emissions resulting from new development and apply all feasible mitigation measures to lessen the potentially significant adverse impacts. For non-stationary sources, the BAAQMD recommends greenhouse gas emissions be limited to 1,100 metric tons of CO2 per year, or compliance with a Qualified Greenhouse Gas Reduction Strategy. Mendocino County Air Quality Management District recommends, with some exceptions, that the BAAMQCD's Air Quality Guidelines be used.

Depending on the nature of the action taken by affected persons in response to the regulation, significant impacts may arise other issue areas, as shown in Table 7-1. Future CEQA reviews conducted by the State Water Board or by another lead agency can be expected to identify any significant project-specific environmental effects in these issue areas and mitigate them to less-than-significant-levels. For instance, the lead agency would be required to assess whether the project will have an adverse impact on surface and subsurface historical resources within the area of project effect and if so to mitigate that effect. To adequately assess and mitigate project-related impacts to archaeological resources, the lead agency would work with the Native American Heritage Commission and Native American contacts to develop appropriate mitigation measures. In addition, other regulatory mechanisms may provide opportunities for minimizing and avoiding significant environmental effects.

Mitigation Measure SWD-MM-1

Project proponents will comply with any mitigation measures imposed by applicable state and local agencies to mitigate potentially significant impacts associated with the removal or modification of surface water diversion structures in response to the regulation. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state or local agency.

Mitigation Measure SWD-MM-2

Project proponents will comply with any construction mitigation measures imposed to reduce impacts to water quality. These measures will be applied on a project-level basis and may be tailored in consultation with the North Coast Regional Water Quality Control Board. These measures may include the filing of a report of waste

discharge, or applying for coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity if the construction activities disturb more than one acre of soil.

Mitigation Measure SWD-MM-3

Project proponents will comply with any mitigation measures imposed by the United States Army Corps of Engineers (US ACE) and the State Water Resources Control Board to reduce potential short-term impacts to wetlands from construction activities to less-than-significant levels. Where applicable, measures will be applied on a project-level basis and may be tailored in consultation with the US ACE depending on the severity of the wetland impacts.

Mitigation Measure SWD-MM-4

Project proponents will comply with any mitigation measures imposed by the Department of Fish and Game (DFG) to reduce potential short-term impacts to fish and wildlife from construction activities to less-than-significant levels. Where applicable, measures will be applied on a project-level basis and may be tailored in consultation with the DFG depending on the severity of the wetland impacts.

Mitigation Measure SWD-MM-5

Project proponents will comply with any mitigation measures imposed by the applicable air district to reduce construction emissions. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate air district, depending on the severity of anticipated construction emissions.

Mitigation Measure SWD-MM-6

Project proponents will comply with any mitigation measures imposed by state and local agencies to mitigate potentially significant impacts from greenhouse gas emissions due to construction activities taken in response to the proposed regulation. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state and local agencies.

7.2.4 Potential Action: Use of wind machines

In response to the regulation, persons may choose to install wind machines to reduce or eliminate the use of water for frost protection. Use of wind machines may result in aesthetic impacts, air quality impacts, impacts to biological resources, construction-related impacts, and noise impacts. Noise impacts from wind machine usage for frost protection would be intermittent and may affect adjacent neighbors for only a few hours several times during the frost season. Operation of wind machines would occur during critical temperature and wind conditions that

essentially control the necessity and timing of operation. These conditions can occur during night time or very early in the morning, and would occur on an irregular basis.

Regulatory Framework

~~Although o~~Ordinances governing small wind energy systems were found for Sonoma County, but no codes or ordinances affecting agricultural wind machines in Sonoma County were ~~not~~ found. In addition, no codes or ordinances affecting agricultural wind machines were found for Mendocino County.

Although agricultural wind machines for frost protection differ from small wind energy systems, mitigation measures for the agricultural wind machines, if developed, could be similar to those measures contained in Sonoma County ordinances for small wind energy systems.

For example, Sonoma County Zoning Code Section 26-88-135 requires small wind energy systems to obtain either a zoning permit or use permit, depending on their location. It also contains standards for the siting and operation of small wind energy systems. The standards cover aesthetics, noise, erosion control, and electrical requirements. Section 26-88-135 prohibits decibel levels from exceeding the maximum noise levels contained in the general plan, except during short-term events including utility outages and severe wind storms. Section 26-88-135 requires the planting of landscaping to minimize visual impacts and prevent erosion if vegetation is removed during construction.

~~Although the use of wind machines for frost protection is a different application of small wind devices, mitigation measures for the agricultural use of wind machines could be similar to those measures for small wind energy systems contained in Sonoma County ordinances.~~

Construction activities for installing wind machines in response to the proposed regulation would result in greenhouse gas emissions from construction equipment exhaust, vehicle trips. If existing surface or groundwater diverters switch from pumping water to operating wind machines, operational greenhouse gas emissions may be reduced relative to existing conditions, depending on the type of pump or motor installed. However, in the absence of project-specific information, it is difficult to determine which type of pump or motor would be used, or the number, type, and frequency of construction equipment that would be used. The California Attorney General's office issued a report titled "The California Environmental Quality Act: Addressing Global Warming at the Local Agency Level" that identifies various measures that could be implemented to reduce greenhouse gas emissions at the project level, including the requirement to use best management practices in agriculture to reduce greenhouse gas emissions. The Bay Area Air Quality Management District's (BAAQMD) Air Quality Guidelines, updated May 2011, recommends that lead agencies quantify greenhouse gas emissions resulting from new development and apply all feasible mitigation measures to lessen the potentially significant adverse impacts. It recommends CEQA thresholds of significance that

would limit greenhouse gas emissions from stationary sources to 10,000 metric tons of CO2/yr. This threshold is an interim threshold which will be reevaluated when the Air Resources Board more fully develops and implements other mitigation measures such as cap and trade programs. For non-stationary sources, the BAAQMD recommends greenhouse gas emissions be limited to 1,100 metric tons of CO2/yr, or compliance with a Qualified Greenhouse Gas Reduction Strategy. Mendocino County Air Quality Management District recommends, with some exceptions, that the BAAMQCD's Air Quality Guidelines be used.

Depending on the nature of the action taken by affected persons in response to the regulation, significant impacts may occur in other issue areas, as shown in Table 7-1. Future CEQA reviews can be expected to identify any significant project-specific environmental effects in these issue areas and mitigate them to less-than-significant levels. For instance, the lead agency would be required to assess whether the project will have an adverse impact on surface and subsurface historical resources within the area of project effect and if so to mitigate that effect. To adequately assess and mitigate project-related impacts to archaeological resources, the lead agency would work with the Native American Heritage Commission and Native American contacts to develop appropriate mitigation measures. In addition, other regulatory mechanisms may provide opportunities for minimizing and avoiding significant environmental effects.

Mitigation Measure WM-MM-1

Persons choosing to install and operate wind machines will comply with any mitigation measures that may be imposed by state and local agencies to mitigate potentially significant impacts associated with the installation and use of wind machines in response to the regulation. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state or local agency. For instance, mitigation measures to reduce potential aesthetics, noise, and erosion impacts could be developed that are similar to those measures for small wind energy systems contained in Sonoma County ordinances.

Mitigation Measure WM-MM-2

Persons choosing to install and operate wind machines will comply with any mitigation measures prescribed by the applicable state and local agencies to mitigate potentially significant impacts from greenhouse gas emissions due to construction or operation of wind machines. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state and local agencies.

7.2.5 Potential Action: Installation and Operation of Orchard Heaters

In response to the regulation, persons could install heaters to reduce or eliminate the use of water for frost protection. Operation of orchard heaters can result in emissions of carbonaceous material that exceed air emission standards.

Regulatory Framework

The Bay Area Air Quality Management District (BAAQMD), the Northern Sonoma County Air Pollution Control District (NSCAPCD), and the Mendocino County Air Quality Management District are the regional agencies responsible for regulating sources of air pollution in the project area. The BAAQMD has jurisdiction over the southern portion of Sonoma County, while the NSCAPCD has jurisdiction over Sonoma County coastal areas, north of Windsor, and along the Russian River.

Northern Sonoma County Air Pollution Control District Rule 480 and Mendocino County Air Quality Management District require that heaters used for frost protection be approved by the California Air Resources Board, and that the heaters shall not produce more than one gram per minute of unconsumed solid carbonaceous material.

Construction activities for installing orchard heaters in response to the proposed regulation would result in greenhouse gas emissions from construction equipment exhaust, vehicle trips. If existing surface or groundwater diverters switch from pumping water to orchard heaters, operational greenhouse gas emissions may be reduced relative to existing conditions, depending on the type of pump or motor installed. However, in the absence of project-specific information, it is difficult to determine which type of pump or motor would be used, or the number, type, and frequency of construction equipment that would be used. The California Attorney General's office issued a report titled "The California Environmental Quality Act: Addressing Global Warming at the Local Agency Level" that identifies various measures that could be implemented to reduce greenhouse gas emissions at the project level, including the requirement to use best management practices in agriculture to reduce greenhouse gas emissions. The Bay Area Air Quality Management District's (BAAQMD) Air Quality Guidelines, updated May 2011, recommends that lead agencies quantify greenhouse gas emissions resulting from new development and apply all feasible mitigation measures to lessen the potentially significant adverse impacts. It recommends CEQA thresholds of significance that would limit greenhouse gas emissions from stationary sources to 10,000 metric tons of CO2/yr. This threshold is an interim threshold which will be reevaluated when the Air Resources Board more fully develops and implements other mitigation measures such as cap and trade programs. For non-stationary sources, the BAAQMD recommends greenhouse gas emissions be limited to 1,100 metric tons of CO2 per year, or compliance with a Qualified Greenhouse Gas Reduction Strategy. Mendocino County Air Quality Management District recommends, with some exceptions, that the BAAMQCD's Air Quality Guidelines be used.

Depending on the nature of the action taken by affected persons in response to the regulation, significant impacts may occur in other issue areas, as shown in Table 7-1. ~~Future CEQA reviews~~For individual projects subject to CEQA, future environmental reviews can be expected to identify any significant project-specific environmental effects in these issue areas and mitigate them to less-than-significant-levels. In addition, other regulatory mechanisms can be expected to provide opportunities for minimizing and avoiding significant environmental effects. For instance, the lead agency would be required to assess whether the project will have an adverse impact on surface and subsurface historical resources within the area of project effect and if so to mitigate that effect. To adequately assess and mitigate project-related impacts to archaeological resources, the WDMP would work with the Native American Heritage Commission and Native American contacts to develop appropriate mitigation measures.

Mitigation Measure OH-MM-1

Persons choosing to install and use orchard heaters in response to the regulation will comply with any mitigation measures imposed by state and local agencies to mitigate potentially significant impacts. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state or local agency. For example, persons shall comply with any mitigation measures imposed by the applicable air district to reduce operational emissions. The nature of the mitigation measures would be dependent on the severity of anticipated operational emissions.

Mitigation Measure OH-MM-2

Persons choosing to install and operate orchard heaters in response to the regulation will comply with any mitigation measures imposed by state and local agencies to mitigate potentially significant impacts from greenhouse gas emissions due to construction and operation of orchard heaters. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state and local agencies.

7.2.6 Potential Action: Installation of USGS stream gaging stations

In response to the proposed regulation, persons may be required to install US Geological Services stream gaging stations. These stations usually consist of permanent buildings housing equipment and computers located on land adjacent to the stream gaging location, and instream measuring equipment. Construction activities may result in temporary impacts to air quality, sedimentation, erosion, and non-visible water quality parameters.

Regulatory Framework

The Basin Plan for the North Coast Regional Water Quality Control Board contains numeric and narrative water quality objectives designed to protect the beneficial

uses of surface waters. If the construction of stream gaging stations would result in the discharge of waste to waters of the State, the discharger must file a report of waste discharge with the appropriate Regional Water Quality Control Board and obtain a waste discharge requirement (WDR). (Wat. Code, § 13260.) The WDR must implement the applicable Basin Plan and protect the beneficial uses of the receiving waters.

Another regulatory tool that may mitigate the water quality impacts of construction activities is the North Coast Regional Water Quality Control Board's Sediment TMDL Implementation Policy. The Sediment TMDL Implementation Policy states that Regional Water Board staff shall control sediment pollution by using existing permitting and enforcement tools, including individual NPDES permits and coverage under the general construction stormwater permit. The goals of the TMDL Implementation Policy are to control sediment waste discharges to impaired water bodies so that the TMDLs are met, sediment water quality objectives are attained, and beneficial uses are no longer adversely affected by sediment.

As indicated in the TMDL Implementation Policy, certain construction activities may be covered under the General Permit for Discharges of Storm Water Associated with Construction Activity adopted by the State Water Board. Covered activities may include grading and excavation of gaging station sites and pump and piping replacement. Under the general permit, construction Best Management Practices (BMPs) such as silt fencing, straw waddles, and other erosion BMPs can be used to contain stormwater runoff and reduce erosion potential. Pursuant to the State Water Board's General Construction Permit, for any construction involving disturbance of 1 acre of more, a Stormwater Pollution and Prevention Plan (SWPPP) would need to be prepared.

Potential mitigation for water quality impacts due to construction of stream gaging stations may also involve Water Quality Certifications from the Regional Water Quality Control Board. Water quality certification requirements would apply to anyone proposing to conduct a dredge or fill project that requires a federal permit and may result in a discharge to waters of the United States, including wetlands, year round and seasonal streams, lakes and other surface waters. A Clean Water Act (CWA) Section 401 Water Quality Certification is a finding from the Regional Water Quality Control Board that the proposed project will comply with CWA Sections 301, 302, 303, 306 and 307, the applicable Basin Plan, and other appropriate provisions of State law.

Projects having a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) either individually or in combination with the known or probable impacts of other activities through direct removal, filling, hydrological interruption, or other means may need to obtain a permit from the United States Army Corps of Engineers (USACE). If the project will require disturbance of a wetland and the USACE determines that the wetland is not subject to regulation under Section 404 of the

CWA, Section 401 water quality certification is not required. However, the Regional Water Board may require WDRs if fill material is placed into waters of the state. If all wetlands cannot be avoided as part of the project, the applicant will be required to file an application for WDRs with the Regional Water Board.

The California Department of Fish and Game (DFG) is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. Fish and Game Code section 1602 requires DFG to be notified regarding any proposed activity that may substantially modify a river, stream, or lake. Persons proposing to construct USGS stream gaging stations should notify the DFG if the activity will:

- substantially divert or obstruct the natural flow of any river, stream or lake;
- substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake; or
- deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

If DFG determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement would be prepared. Conditions that DFG may require include, but are not limited to, avoidance or minimization of vegetation removal, use of standard erosion control measures, limitations on the use of heavy equipment, limitations on work periods to avoid impacts on fisheries and wildlife resources, and requirements to restore degraded sites or compensate for permanent habitat losses. The Agreement would include reasonable conditions necessary to protect those resources and must comply with the California Environmental Quality Act (CEQA).

Potentially significant air quality impacts associated with construction of USGS gaging stations are limited to those resulting from short-term construction activities. Construction-related emissions could include exhaust from construction equipment and fugitive dust from land clearing, earthmoving, movement of vehicles, and wind erosion of exposed soil during construction. The San Francisco Bay Area Quality Management District has developed mitigation measures to reduce construction-related emissions.

Construction activities would result in greenhouse gas emissions from construction equipment exhaust, vehicle trips. The California Attorney General's office issued a report titled "The California Environmental Quality Act: Addressing Global Warming at the Local Agency Level" that identifies various measures that could be implemented to reduce greenhouse gas emissions at the project level. The Bay Area Air Quality Management District's (BAAQMD) Air Quality Guidelines, updated May 2011, recommends that lead agencies quantify greenhouse gas emissions resulting from new development and apply all feasible mitigation measures to lessen the potentially significant adverse impacts. For non-stationary sources, the BAAQMD recommends greenhouse gas emissions be limited to 1,100 metric tons of CO2 per year, or compliance with a Qualified Greenhouse Gas Reduction Strategy.

Mendocino County Air Quality Management District recommends, with some exceptions, that the BAAMQCD's Air Quality Guidelines be used.

Depending on the nature of the action taken by affected persons in response to the regulation, significant impacts may occur in other issue areas, as shown in Table 7-1. Future CEQA reviews can be expected to identify any significant project-specific environmental effects in these issue areas and mitigate them to less-than-significant-levels. For instance, the lead agency would be required to assess whether the project will have an adverse impact on surface and subsurface historical resources within the area of project effect and if so to mitigate that effect. To adequately assess and mitigate project-related impacts to archaeological resources, the lead agency would work with the Native American Heritage Commission and Native American contacts to develop appropriate mitigation measures. In addition, other regulatory mechanisms may provide opportunities for minimizing and avoiding significant environmental effects.

Mitigation Measure SG-MM-1

Project proponents will comply with any mitigation measures imposed by state and local agencies to mitigate potentially significant impacts associated with the installation of USGS stream gaging stations in response to the regulation. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state or local agency.

Mitigation Measure SG-MM-2

Project proponents will comply with any construction mitigation measures imposed to reduce impacts to water quality. These measures will be applied on a project-level basis and may be tailored in consultation with the North Coast Regional Water Quality Control Board. These measures may include the filing of a report of waste discharge, or applying for coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity if the construction activities disturb more than one acre of soil.

Mitigation Measure SG-MM-3

Project proponents will comply with any mitigation measures from the United States Army Corps of Engineers (US ACE) or the Regional Water Quality Control Board to reduce potential short-term impacts to wetlands from construction activities to less-than-significant levels. Where applicable, measures will be applied on a project-level basis and may be tailored in consultation with the US ACE depending on the severity of the wetland impacts.

Mitigation Measure SG-MM-4

Project proponents will comply with any mitigation measures imposed by the Department of Fish and Game (DFG) to reduce potential short-term impacts to fish

and wildlife from construction activities to less-than-significant levels. Where applicable, measures will be applied on a project-level basis and may be tailored in consultation with the DFG depending on the severity of the wetland impacts.

Mitigation Measure SG-MM-5

Project proponents will comply with any mitigation measures imposed by the applicable air district to reduce construction emissions. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate air district, depending on the severity of anticipated construction emissions.

Mitigation Measure SG-MM-6

Project proponents will comply with any mitigation measures imposed by state and local agencies to mitigate potentially significant impacts from greenhouse gas emissions due to installation of USGS stream gaging stations. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate state and local agencies.

7.3 Mitigation Measures for Cumulative Impacts

Potential mitigation measures for cumulative impacts are anticipated to be the same as those described above.

8 CUMULATIVE AND GROWTH-INDUCING IMPACTS

8.1 Cumulative Impacts

Introduction

This section evaluates the cumulative and growth-inducing impacts associated with actions that may be taken in response to the proposed regulation.

Cumulative Impacts

Cumulative impacts can result from "the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects." (CEQA Guidelines, § 15355, subd. (b).) The environmental impacts of actions taken by affected persons that are individually limited may be cumulatively considerable when viewed in conjunction with the effects of past, current, and probable future projects in the affected geographic area.

Implementation of the proposed regulation may result in cumulative impacts. Some of these impacts could be cumulatively considerable. Suggested mitigation is provided below for possible cumulatively considerable impacts, but much of the mitigation would require actions by third parties over which the State Water Board has no decision-making authority. Where impacts cannot be feasibly mitigated, a Statement of Overriding Considerations will be necessary.

Air Quality

Climate change

The proposed regulation could result in increased greenhouse gas emissions that are cumulatively considerable when viewed in conjunction with other projects that produce greenhouse gases. The Global Warming Solutions Act of 2006 requires the State to reduce its global warming emissions to year 2000 levels by the year 2010, to 1990 levels by 2020, and 80 percent below 1990 levels by 2050.

Water diversion for frost protection typically involves the use of pumps which emit greenhouse gases (primarily carbon dioxide, methane, nitrous oxide, and ozone) that may contribute to global climate change. Alternative methods of frost protection that do not rely on water could still rely on long term operation of other types of pumps, with potential for greenhouse gas emissions. Switching from direct pumping of water from surface streams to alternative frost protection methods, such as groundwater extraction, wind machines, or orchard heaters could result in a reduction in greenhouse gas emissions relative to existing conditions if the engines or motors used to power the alternative frost protection methods emit less

greenhouse gases than the water diversion pumps that they replaced. However, in the absence of project-specific information, it is difficult to determine which alternative frost protection methods would be used, or the number and type of equipment that would be installed. In addition, construction projects, particularly involving the modification or construction of offstream reservoirs, would produce emissions from vehicles and equipment that would contribute to greenhouse gas emissions

Greenhouse gases tend to accumulate in the atmosphere because of their relatively long lifespan. Therefore, small contributions of greenhouse gases may be cumulatively considerable. Because it is unknown to what extent climate change would be affected by the greenhouse gases emitted by the actions affected parties may take in response to the proposed regulation, the impact to climate change is considered cumulatively considerable. Implementation of Mitigation Measures GW-MM-5, OFS-MM-4, SWD-MM-6, WM-MM-2, OH-MM-2, and SG-MM-6 would result in lower greenhouse gas emissions than had they not been incorporated, but they would not completely eliminate greenhouse gas emissions.

Changes in climate may affect environmental conditions, such as rises in surface water levels in estuaries and increases in water temperatures in coastal streams. Even minor changes in temperature, for example, would likely have implications for salmonids, and adverse effects related to temperature could be exacerbated by changes in stream flow, particularly if temperatures increase. Although actions that may be taken in response to the proposed regulation could contribute to cumulatively considerable impacts to climate change, the regulation as a whole will serve to protect anadromous salmonids.

Other air pollutant emissions

The environmental impact analysis identified other potential air quality impacts associated with actions affected persons might take in response to the proposed regulation. Cumulative impacts to air quality due to pollutants are difficult to quantify due to the variety of frost protection methods available, the unknown number of affected parties that may take action in response to the proposed regulation, differences in fuel types, differences in energy usage used to power associated motors, and the relative efficiencies of the motors that could be used. Depending on the actions that may be taken in response to the proposed regulation, air pollutant emissions may be reduced relative to existing conditions due to use of more efficient pumps, engines, or motors. For example, the analysis contained in Section 6 of air pollutant emissions resulting from the use of orchard heaters indicates potentially significant levels of air emissions may occur if diesel fuel is used, but also discloses that more efficient and cheaper energy sources are available which would likely result in lower air emissions than the motors that are currently in use for water diversion for frost protection.

Air emission information was not found for the types of motors and pumps that may be used for different frost protection methods. However, diesel fuel consumption data was available. Table 8-14, Diesel Fuel Consumption of Various Frost Protection Methods, compares the average range of diesel fuel consumption for various frost protection methods. The relative differences in fuel consumption can be correlated to relative differences in air pollutant emissions. For example, converting sprinkler systems from high flow to low flow will likely reduce overall emissions because smaller, more efficient motors can be used that consume less fuel to pressurize pipes and distribute water. If affected persons who directly divert water for frost protection switch to groundwater sources, direct tradeoffs in air emissions will likely occur because similar motors are used on pumps for surface water and groundwater. Conversion from pumping of surface water to use of wind machines has the potential to increase overall emissions because fuel consumption for operating high volume sprinklers is less than what would be needed for wind machines. Conversion to heaters from high volume sprinklers represents the largest potential increase in pollutant emissions. Although diesel fuel consumption was used in this analysis, due to the current and projected future cost of oil, it is likely that individuals will choose to install more efficient motors that operate on electricity, propane, or natural gas, which are much cleaner burning fuels than diesel fuel. As a result, it is anticipated that air pollutant emissions from more efficient motors will be similar to those already occurring from using high volume sprinklers.

Although the proposed regulation could contribute to potentially significant cumulative impacts to air quality, probable trade-offs in emissions as a result of existing water diverters choosing other methods of frost protection, and implementation of Mitigation Measures GW-MM-1, OFS-MM-3, SWD-MM-5, WM-MM-1, OH-MM-1, and SG-MM-5 would reduce any regulation-related impacts to air quality to levels that are not cumulatively considerable.

Table 8-14. Diesel Fuel Consumption of Various Frost Protection Methods

Method	Diesel Fuel Consumption	
	gal/hr/acre	BTUs/hr/acre (in thousands)
Heaters	20 – 40	2,800 – 5,600
Wind Machines	0.5 – 1.5	70 – 210
High Volume Sprinklers	0.25 – 0.75	35 – 105
Low Volume Sprinklers	0.10 – 0.25	14 - 35

*Source: University of Florida IFAS Extension (1994)

Surface water quality

The proposed regulation could contribute to potentially significant cumulative impacts to surface water quality. As discussed in the Sections 6 and 7, the proposed regulation could result in potentially significant impacts to surface water quality as a result of the following activities that third parties might take in response to the proposed regulation: modification or construction of offstream storage facilities, installation of USGS stream gages, and modification or removal of diversion dams (See Tables 6-3, 6-12, and 6-13). These water quality impacts may include, but are not limited to, short term release of sediment, fluctuations in stream temperature, and discharge of nonvisible pollutants. To the extent that these impacts may occur in streams that are already water quality impaired as a result of other land use or water development projects, the proposed regulation could contribute to significant cumulative water quality impacts. As previously discussed, the North Coast Regional Water Quality Control Board has regulatory tools to address water quality, including the Basin Plan and the Sediment TMDL Implementation Policy. While implementation of Mitigation Measures OFS-MM-2, OFS-MM-5, OFS-MM-6, OFS-MM-7, SWD-MM-2, SWD-MM-3, SWD-MM-4, SG-MM-2, SG-MM-3, and SG-MM-4 would mitigate any regulation-related impacts to water quality, the cumulative impacts to water quality may not be reduced to less than significant levels. Although the proposed regulation could contribute to potentially significant cumulative impacts to water quality, it should be noted that the regulation as a whole should serve to improve water quality by preventing the dewatering of streams, which will result in a dilution factor for pollutant loadings throughout the frost season.

Water Supply

Increases in groundwater pumping as a result of the proposed regulation could contribute to potentially significant cumulative impacts to groundwater resources to the extent that the pumping occurs in overdrafted groundwater basins. Table 6-2 provides an estimate of whether the amount of groundwater available to satisfy future groundwater demands for frost protection use is adequate. While implementation of Mitigation Measures GW-MM-2, GW-MM-3, and GW-MM-4 may mitigate any regulation-related impacts to groundwater supplies, the cumulative impacts to groundwater supplies may not be reduced to less than significant levels. For example, in Sonoma County, Mitigation Measure GW-MM-2 consists of a non-regulatory approach to managing groundwater supplies. This measure would be implemented on a voluntary basis by groundwater pumpers taking water for purposes other than frost protection. This type of approach could not be relied upon to ensure maintenance of adequate groundwater supplies.

The proposed regulation could result in potentially significant cumulative impacts to biological resources. As disclosed above, increased groundwater pumping could decrease surface water flows, which could harm riparian vegetation or degrade habitat for sensitive species, including salmonids (See Table 6-3.) To the extent that

these impacts occur in streams with flows that already have been impaired as a result of other land use or water development projects, the proposed regulation could contribute to significant cumulative impacts to biological resources if affected persons choose to increase pumping of hydraulically connected groundwater in response to the proposed regulation. While Mitigation Measures GW-MM-3 and GW-MM-4 are sufficient to mitigate any regulation-related impacts to biological resources, the cumulative impacts of increased pumping of hydraulically connected groundwater may not be reduced to less than significant levels. As stated above, however, the proposed regulation as a whole will protect biological resources, including salmonids, by preventing cumulative diversions for frost protection from causing a reduction in stream stage that causes salmonid stranding mortality.~~As stated above, however, the proposed regulation as a whole will protect biological resources, including salmonids, by providing adequate stream stage to prevent stranding mortality of juveniles and redds during the frost season.~~

Other environmental issue areas

The actions that may be taken by affected persons in response to the regulation may lead to potentially significant impacts in other environmental resource areas as summarized in Table 7-1. ~~Future CEQA reviews~~For individual projects subject to CEQA, future environmental reviews conducted by the State Water Board or by another lead agency can be expected to identify any significant project-specific environmental effects and mitigate them to less-than-significant levels. While implementation of Mitigation Measures GW-MM-1, OFS-MM-1, SWD-MM-1, WM-MM-1, OH-MM-1, SG-MM-1, and LU-MM-1 will reduce environmental impacts for those resource areas for which adequate state or local regulations exist, there may be resource areas for which the existing state and local regulations do not provide adequate protection. In these circumstances, environmental impacts due to the actions taken in response to the regulation could be cumulatively considerable.

8.2 Growth-Inducing Impacts

Section 21100, subdivision (b)(5) of the Public Resources Code requires an EIR to discuss the growth-inducing impacts of a project. (See also State CEQA Guidelines, § 15126.) An EIR must discuss specifically "the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment." (State CEQA Guidelines, § 15126.2, subd. (d).)

As discussed in Section 6, it is anticipated that there could be indirect impacts to agricultural resources as a result of actions affected persons may take in response to the regulation. These include reductions in vineyard acreage due to construction or expansion of existing offstream storage. Increased costs associated with actions that may be taken in response to the proposed regulation may result in conversion of some vineyard acreage from present use to other crops.

As the Draft Fiscal and Economics Report shows, a reduction in vineyard acreage may occur due to reduced profit margins, which could cause continued production under the present use to become infeasible. Vineyard acreage converted to other agricultural uses could leave its present use as a direct or indirect result of an increasing cost burden, such as implementation of best management practices to prevent stranding mortality. As discussed in Section 6, it is unlikely that agricultural land leaving its present use would be converted to urban uses. Accordingly, the loss of vineyard acreage due to new or expanded storage reservoirs or increased production costs would not result in a growth-inducing impact.

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10 REFERENCES

Abbott, R. R., and R. N. Coats. 2001. Expert witness report: Cumulative impacts on fisheries resources from intensive viticulture practices in Napa County, CA. Prepared for Tom Lippe Law Office, San Francisco, CA.

American Rivers. 2002. The Ecology of Dam Removal. A Summary of Benefits and Impacts. Viewed online December 2007 at http://www.americanrivers.org.

American Rivers and Trout Unlimited. 2002. Exploring Dam Removal – A Decision-Making Guide. Viewed online December 2007 at http://www.americanrivers.org.

Anglin, D., Haeseker, J., Schaller, H., Tiffan, K., Hatten, J., Hoffarth, P., Nugent, J., Benner, D. and Yoshinaka, M. (2006). Effects of Hydropower Operations on Spawning Habitat, and Stranding/Entrapment Mortality of Fall Chinook Salmon in the Hanford Reach of the Columbia River, Final Report. United States Fish and Wildlife Service, Columbia River Fisheries Program Office; United States Geological Survey Biological Resources Division, Columbia River Research Laboratory; Washington Department of Fish and Wildlife; Nugent GIS and Environmental Services; Fish Passage Center; Cexec, Incorporated; Alaska Department of Fish and Game; Yakama Nation; and Columbia River Inter-Tribal Fish Commission.

Asmus, P., Fullerton, K., Peterson, S., Rhoads-Weaver, H., Shutak, A. and Schwartz, S. (2003). Permitting Small Wind Turbines: A Handbook. Retrieved from www.consumerenergy.org/erprebate/forms.

Bay Area Air Quality Management District. May 2011 Update. California Environmental Quality Act Air Quality Guidelines.

Beach, R.F. 1996. The Russian River: An Assessment of Its Condition and Governmental Oversight. Sonoma County Water Agency, Santa Rosa, California. Sonoma County Water Agency, Santa Rosa, California.

Bradford, M.J. An experimental study of stranding of juvenile salmonids on gravel bars and sidechannels during rapid flow decreases. Regulated Rivers: Research and Management 13:395-401 (1997).

Broadbent, J., Roggenkamp, J., McKay, J., Bunger, B., Hilken, H., Vintze, D., Tholen, G., Martien, P., Lau, V., Young, A., Kirk, A. and Michael, S. (2011). California Environmental Quality Act Air Quality Guidelines. Prepared for Bay Area Air Quality Management District. San Francisco, CA.

Brown, L.R., P.B. Moyle, and R.M. Yoshiyama. 1994. Historical Decline and Current Status of Coho Salmon in California. North American Journal of Fisheries Management 14(2): 237-261.

California Farm Bureau Federation. 2011. Viewed online March 2011 at http://www.cfbf.com/index.cfm.

California Native Plant Society. Inventory of Rare, Threatened, and Endangered Plants. California Native Plant Society. Viewed online in April 2011 at http://www.rareplants.cnps.org/.

Circuit Rider Productions, Inc. 2003. California Salmonid Stream Habitat Restoration Manual [including] Part XI Riparian Habitat Restoration.

Cook, D. 2003. Chinook Salmon Spawning Study Russian River Fall 2002. Sonoma County Water Agency, Santa Rosa, California. April.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. Roe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Office of Biological Services, U.S. Fish and Wildlife Service (FWS/OBS-79/31). Available online at http://www.nwrc.usgs.gov/diglib.htm.

Crawford, T. and Leonard, A. 1960. Wind machine-orchard heater system for Frost Protection in deciduous orchards. California Agriculture, August 1960, pp. 10-12

Deitch, M., G.M. Kondolf, and A.M. Merenlender, "Hydrologic Impacts of Small-Scale Instream Diversions for Frost and Heat Protection in the California Wine Country." Published in: River Research and Applications 25(2): 118-134 (2009).

Domoto, Paul. 2006. Frost Protection for Fruit Crops. Iowa State University, Department of Agriculture, University Extension.

Edmundson, Steven A., National Oceanic and Atmospheric Administration National Marine Fisheries Service, letter to Chairman Charles Hoppin, State Water Resources Control Board, November 10, 2009.

Edmundson, Steven A., National Oceanic and Atmospheric Administration National Marine Fisheries Service, letter to Victoria Whitney, State Water Resources Control Board Division of Water Rights, February 19, 2009.

Evans, Robert. 1999. Frost Protection in Orchards and Vineyards. USDA Agricultural Research Service, Northern Plains Agricultural Research Laboratory, Sidney, MT.

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. California salmonid stream habitat restoration manual, 3rd edition. California Department of Fish and Game. February.

Fowley, M. and A. Ridway. Updated January 2000. Riparian Corridors—Landholder Benefits and Issues for Management. Viewed online November 2007 at http://www.nor.com.au/ environment/clarencecatchment/vegetation/booklet.html

Frey, Nick. 2006. Sonoma County Grape and Wine Production. Presented at the Iowa Wine Growers Association Annual Convention. Viewed online at http://viticulture.hort.iastate.edu/info/07iawgamtg/sonomafrey.pdf.

Hijmans, R., Cameron, S., Parra, J., Jones, P. and Jarvis, A. Very High Resolution Interpolated Climate Surfaces for Global Land Areas. International Journal of Climatology, 25: 1965-1978 (2005).

Hunter, M.A., Hydropower flow fluctuations and salmonids: A review of the biological effects, mechnical causes, and options for mitigation. State of Washington Department of Fisheries, Technical Report 199, 46 pp. (1992).

ICF Consulting. 2005. A Summary of Existing Research on Low-Head Dam Removal Projects. American Association of State Highway and Transportation Officials (AASHTO), Standing Committee on the Environment. Viewed online December 2007 at the Transportation Research Board of the National Academies at http://www.trb.org/.

Jones, D., D. Koball, L. McCorvey, D. McIlroy, P. Opatz, S. White, L. Marcus. November 10, 2009. Russian River Frost Program.

Kelley, D. W. 1976. The Possibility of Restoring Salmon and Steelhead Runs in Walker Creek, Marin County. Prepared for the Marin Municipal Water District, Corte Madera CA. April.

Kondolf, Matt. Comment Letter for Frost Protection Working Group Meeting, March 30, 2010.

Lewis, D. J., G. McGourty, J. Harper, R. Elkins, J. Christian-Smith, J. Nosera, P. Papper, R. Sanford, L. Schwankl and T. Prichard. 2008. Meeting irrigated agriculture water needs in the Mendocino County portion of the Russian River. University of California Cooperative Extension Mendocino County, University of California Davis Department of Land Air and Water Resources, and University of California Kearny Agricultural Center. 56 pps.

McBain and Trush and Trout Unlimited (MTTU). 2000. Allocating Streamflows to Protect and Recover Threatened Salmon and Steelhead Populations in the Russian River and Other Northcoast Rivers of California. Arcata, CA. July.

McEwan, D. and T. A. Jackson. 1996. Steelhead Restoration and Management Plan for California. California Department of Fish and Game, Sacramento, CA. February.

Mendocino County. 1981. Mendocino County General Plan Open Space and Conservation Element.

Mendocino County Air Quality Management District. October 2010. Memorandum from Christopher Brown. "Clarification of Interim CEQA Criteria and GHG Pollutant Thresholds".

Mendocino County Planning and Building Services, Division III of Title 20, Mendocino Town Zoning Code, Chapter 20.744, Ground Water Evaluation, retrieved from http://www.co.mendocino.ca.us/planning/pdf/CHAPTER_20.744.pdf in April 2011.

Mendocino County Resource Conservation District (MCRCD). 1992. The Garcia River Watershed Enhancement Plan. Prepared for California State Coastal Conservancy. Ukiah, CA. October.

Moyle, P. B. 2002. Inland Fishes of California. Revised and expanded. University of California Press, Berkeley, CA.

Moyle, P. B., R. M. Yoshiyama, J.E. Williams, and E.D. Wikramanayake. 1995. Fish Species of Special Concern in California. Second Edition. California Department of Fish and Game, Sacramento, California.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2011. NOAA Fisheries Office of Protected Resources. Viewed online January through May 2011 at http://www.nmfs.noaa.gov/pr/glossary.htm#e

National Oceanic and Atmospheric Administration, National Marine Fisheries Service (2005 – 2007), Steelhead, Chinook, and Coho Critical Habitat and Distribution Layers, Retrieved from California State Water Resources Control Board Spatial Database, Water33.sde.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2010. Potential Stranding Sites, Retrieved form California State Water Resources Control Board Spatial Database, Water33.sde.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service, "Frost Protection and Salmonids. A threat assessment review and recommendations for future action", presentation for State Water Board workshop, November 18, 2009a.

National Oceanic and Atmospheric Administration National Marine Fisheries Service, "Frost Protection Threat Assessment for Threatened and Endangered Salmonids in the Russian River Watershed," November 10, 2009b.

National Oceanic and Atmospheric Administration National Marine Fisheries Service, "Scope of Potential Frost Protection Impacts on Salmonids. With an

Emphasis on the Russian River" presentation for State Water Board workshop, April 7, 2009c.

Native American Heritage Commission. November 2010. Comment letter, Russian River Frost Protection Regulation, Mendocino and Sonoma Counties.

Nicholls, B. and Racey, P. 2007. Bats Avoid Radar Installations: Could Electromagnetic Fields Deter Bats from Colliding with Wind Turbines?. PLoS ONE, March 2007, Issue 3, e297, pp. 1-7.

North Coast Regional Partnership and Del Norte, Humboldt, Mendocino, Modoc, Siskiyou, Sonoma, and Trinity Counties. 2005. North Coast Integrated Regional Management Plan—Phase 1, July 2005. Submitted to State Water Resources Control Board and Department of Water Resources.

North State Resources, Inc. (NSR). 2000. Saeltzer Dam Fish Passage and Flow Protection Project, Joint Environmental Assessment / Initial Study. Redding, CA.

Opperman, J.J. 2002. Anadromous Fish Habitat in California's Mediterranean-climate Watersheds: Influences of Riparian Vegetation, Instream Large Woody Debris, and Watershed-scale Land Use. Ph.D. Dissertation, University of California Berkeley.

R2 Resource Consultants. 2007. North Coast Instream Flow Policy: Scientific Basis and Development of Alternatives Protecting Anadromous Salmonids. Task 3 Report, including Appendices. Prepared by R2 Resource Consultants, Inc. and Stetson Engineers, Inc.

Roberts, R.C. 1984. The Transitional Nature of Northwestern California Riparian Systems. Pages 85-91 *in* Warner, R.E., and K.M. Hendrix, editors. California Riparian Systems. University of California Press, Berkeley California.

San Joaquin Valley Unified Air Pollution Control District. 2007. 2007 Area Source Emissions Inventory Methodology, 052 – Agricultural Irrigation IC Engines- NG. Viewed online at http://www.valleyair.org/air_quality_plans/EmissionsMethods/MethodForms/Current/AgIrrigEnginesNG2007.pdf.

San Joaquin Valley Unified Air Pollution Control District. 2006. Emission Inventory Methodology, 052 - Orchard Heaters. Viewed online at http://www.valleyair.org/air_quality_plans/EmissionsMethods/MethodForms/Current/Mthd_Orchard%20Heaters_SJV_2005.pdf.

Sawyer, J.O., and T. Keeler-Wolf. 1995. A Manual of California Vegetation. California Native Plant Society, Sacramento.

Schlumberger Water Services. 2007. Sonoma Valley Groundwater Management Plan. Prepared for the Sonoma County Water Agency. Sacramento, CA.

Schneider, C. and Sprecher, S.W. 2000. Wetlands Management Handbook, ERDC/EL SR-00-16, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Snyder, R. and Melo-Abreu, J. 2005. Frost Protection: fundamentals, practice and economics, Volume 1. Prepared for Food and Agriculture Organization of the United Nations. Rome.

Sonoma County Agenda Item Summary Report. 2009. *North Sonoma County Agricultural Reuse: Final Environmental Impact Report Certification*. Board date 05-12-2009. Viewed online at http://www.sonoma-county.org/Board/meetings/meeting_20090512/meeting_20090512_item_51.pdf

Sonoma County Agricultural Commissioner's Office. 2010. Vineyard and Orchard Frost Protection Ordinance. Code of Ordinance Chapter 11B.

Sonoma County Water Agency. 2007. Sonoma Valley Groundwater Management Plan.

Stacey, Gary B., California Department of Fish and Game, memorandum to Victoria A. Whitney, State Water Resources Control Board Division of Water Rights, November 9, 2009.

State of California, Air Resources Board. 2007. Fact Sheet, Control Measure for In-Use Stationary Diesel Agricultural Engines. Sacramento, CA. retrieved from http://www.arb.ca.gov/diesel/ag/documents/facts0107ag.pdf

State of California Air Resources Board webpage Northern Sonoma County Air Pollution Control District List of Rules. Viewed online March 2011 at http://www.arb.ca.gov/drdb/nsc/cur.htm

State of California, Attorney General's Office. January 2010. "Addressing Climate Change at the Project Level", retrieved from http://ag.ca.gov/globalwarming/pdf/GW_mitigation_measures.pdf

State of California, Department of Fish and Game (DFG). 2004. Recovery Strategy for California Coho Salmon. California Department of Fish and Game, Native Anadromous Fish and Watershed Branch, Sacramento, California. Prepared for California Fish and Game Commission.

State of California Department of Fish and Game (CDFG). 2006. Federal and State Endangered Species Act Status for California Anadromous Fish as of April 20, 2006. Available online at http://www.dfg.ca.gov/nafwb/LISTSTAT.pdf.

State of California Department of Fish and Game (CDFG), "Frost Protection Diversions in Mendocino and Sonoma Counties", presentation for State Water Board workshop, November 18, 2009.

State of California Department of Fish and Game (CDFG). 2011. CDFG website, Lake and Streambed Alteration Program. Viewed online January through May 2011 at http://www.dfg.ca.gov/habcon/1600/.

State of California Department of Food and Agriculture. Viewed online September 2007 at http://www.cdfa.ca.gov/

State of California Department of Forestry and Fire Protection Fire and Resource Assessment Program. 2003. Census 2000 Block Group Data Layer, Sacramento, CA, Retrieved from Cal-Atlas Geospatial Clearinghouse at http://atlas.ca.gov/download.html#/casil/society/demographics

State of California Department of Transportation. 1999. California Scenic Highway Mapping System. Available online at: http://www.dot.ca.gov/hq/LandArch/scenic_highways/index.htm. Accessed November 2007. Last updated December, 28, 1999.

State of California Department of Water Resources. 1982. Evaluation of Ground Water Resources Sonoma County Volume 2: Santa Rosa Plain. Bulletin 119-4, September 1982.

State of California Department of Water Resources (DWR). 2003. California's Groundwater: Bulletin 118 Update 2003. Sacramento, CA.

State of California Department of Water Resources. 2007. Groundwater_basins_B118_03, Retrieved from California State Water Resources Control Board Spatial Database, Water33.sde.

State of California Division of Land Resource Protection. Important Farmland Categories. Viewed online March 2011 at: http://www.consrv.ca.gov/DLRP/fmmp/mccu/map_categories.htm.

State of California Geological Survey. 2002. California Geomorphic Provinces, Note 36. Available online at http://www.consrv.ca.gov/CGS/information/geologic_mapping/index.htm.

State of California Natural Resources Agency. 2008. California Base Map, Map server accessed at http://atlas.resources.ca.gov/

State of California State Parks. Various pages viewed online March 2011, including http://www.parks.ca.gov/parkindex/region_info.asp?regiontab=0&id=1

State of California, North Coast Regional Water Quality Control Board (NCRWQCB), NCRWQCB website, various pages. Viewed online January through May 2011 at http://www.waterboards.ca.gov/northcoast/.

State of California, North Coast Regional Water Quality Control Board. 2010. 2010 CWA Section 303(d) List of Water Quality Limited Segments Map. Retrieved from http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/303d/

State of California, State Water Resources Control Board (SWRCB). 1997. Proposed actions to be taken by the Division of Water Rights on pending water right applications within the Russian River watershed. Staff report, August.

State of California, State Water Resources Control Board (SWRCB). 1998a. Report of the Investigation of the Navarro River Watershed Complaint in Mendocino County. Staff report, July.

State of California, State Water Resources Control Board (SWRCB). 2011. SWRCB website, various pages. Viewed online January through May 2011 at http://www.swrcb.ca.gov/.

State of California, State Water Resources Control Board Spatial Database, Water33.sde. Various GIS layers.

State of California, State Water Resources Control Board EWRIMS database. Various GIS Layers.

Steiner, P. 1996. A History of the Salmonid Decline in the Russian River. Cooperative project of Sonoma County Water Agency, California State Coastal Conservancy, Steiner Environmental Consulting, Potter Valley CA.

Stetson Engineers Inc. August 2007. North Coast Instream Flow Policy, Potential Indirect Impacts of Modification or Removal of Existing Unauthorized Dams.

Stetson Engineers Inc., Technical Memorandum titled, “Approach to Delineate Subterranean Streams and Determine Potential Streamflow Depletion Areas, Policy for Maintaining Instream Flows in Northern California Coastal Streams,” February 28, 2008.

Stetson Engineers, Inc., Draft Technical Memorandum titled, “Methodology and Sources of Information. Delineation of Subterranean Streams and Potential Streamflow Depletion Areas, Policy for Maintaining Instream Flows in Northern California Coastal Streams,” May 16, 2008.

Stetson Engineers, Inc., Maps of Russian River Watershed, February 22, March 8, and March 9, 2008.

Stevens, J.S. 2005. Applying the Public Trust Doctrine to River Protection. California Water Plan Update 2005; 4.393–4.400.

Stillwater Sciences. 2002. Napa River basin limiting factors analysis. Prepared for San Francisco Bay Water Quality Control Board and California State Coastal Conservancy, Berkeley CA.

University of California Cooperative Extension, "Frost Protection Considerations", presentation for State Water Board workshop, November 18, 2009.

University of California - Berkeley, IHRMP North Coast GIS lab. 2009. Sonoma County Vineyards that have been Mapped as of 12/15/09 Layer, Berkeley, CA.

US Army Corps of Engineers (USACE) 2011. Overview of EPA Authorities for Natural Resource Managers Developing Aquatic Invasive Species Rapid Response and Management Plans: CWA Section 404-Permits to Discharge Dredged or Fill Material. Viewed online March 2011 at http://water.epa.gov/type/oceb/habitat/cwa404.cfm

USDA Forest Service. 1997. Ecological Subregions of California. Section and Subsection Descriptions. Pacific Southwest Region. R%-EM-TP-005. September 1997. Viewed online September 2006 at http://www.fs.fed.us/r5/projects/ecoregions/.

USDA Forest Service - Pacific Southwest Region - Remote Sensing Lab. 2010. Existing Vegetation Data Layer. McClellan, CA. Retrieved from Pacific Southwest Region GIS Clearinghouse at http://www.fs.fed.us/r5/rsl/clearinghouse/data.shtml

US Department of Interior, Bureau of Reclamation, Mid-Pacific Region, South Central California Area Office Fresno, California. 2007. Installation and Rehabilitation of Stream Gages on the San Joaquin River, Fresno, Madera, Merced and Stanislaus Counties, California, Finding of no Significant Impact. Sacramento, CA.

US Natural Resource Conservation Service. 2009. Hydrologic Unit Boundary Layer, Retrieved from California State Water Resources Control Board Spatial Database, Water33.sde.

WorldClim – Global Climate Data. 2005. Global Climate Layers, 30 arc-seconds Min. Temperature Raster Data Set. Museum of Vertebrate Zoology, University of California, Berkeley, CA. Retrieved from Worldclim at http://www.worldclim.org/current

Appendices

Appendix A

Notice of Preparation

The text of this appendix is provided in a separate document.

Appendix B

Special-Status Plants Occurring in Riparian, Freshwater Marsh, and Vegetated Lacustrine Habitats

The text of this appendix is provided in a separate document.

Appendix C

Special-Status Animals Occurring in Riparian, Freshwater Marsh, and Vegetated Lacustrine Habitats

The text of this appendix is provided in a separate document.

Appendix D

Approved STD Form 399 and Attachment:
Economic and Fiscal Impacts of the Proposed
Russian River Frost Regulation

The text of this appendix is provided in a separate document.

Appendix E

Revised Draft Russian River Frost Protection Regulation

The text of this appendix is provided in a separate document.