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Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

By hand delivery

RE: Comment Letter – Proposed Russian River Frost Protection Regulation

Dear Board Members:

On behalf of Williams Selyem, California Farm Bureau Federation, Fetzer Vineyards, Whispering Oak Vineyards, LLC, AG Unlimited, Lyman/Tremont, Saini Farms Inc., Yokayo Wine Company, Orr's Creek Vineyard LP and other interested parties, we submit this comment letter on the State Water Resources Control Board's (SWRCB) proposed Russian River Frost Protection Regulation. This letter is divided into Sections I, II and III.

Section I explains that as a threshold matter, the SWRCB has not fulfilled the prerequisites for enacting a reasonable use regulation pursuant to Water Code section 100 and Article X, Section 2 of the California Constitution. The SWRCB has not made the necessary factual and legal findings to conclude that water use for frost protection in the Russian River watershed is an unreasonable use of water unless managed in accordance with a water demand management plan.

Section II discusses the following flaws with the SWRCB's draft EIR (DEIR).

1. The project purpose and project description are defined so narrowly that they prohibit consideration of a reasonable range of alternatives.
2. The DEIR's failure to define and analyze the basic project objective – to prevent stream stage changes to avoid stranding – prevents meaningful impact disclosure and comparison of alternatives.
3. The DEIR fails to identify assessment methodologies and thresholds of significance.
4. The DEIR fails to disclose and analyze significant effects.
   a. The DEIR fails to disclose and analyze significant effects on agriculture.
   b. The DEIR's failure to address SCWA's operation of Warm Springs Dam and Coyote Dam and rediversion for municipal purposes will frustrate the regulation and does not disclose associated impacts.
5. The regulation and DEIR mitigation measures do not have a substantial nexus to the regulated frost water use, and accordingly are constitutionally invalid.
6. The DEIR mitigation measures are not feasible.
7. The DEIR improperly defers development of mitigation to a later time.

8. The mitigation measures are overbroad and may cause significant redirected impacts.
9. The DEIR improperly rejects and does not consider feasible alternatives with fewer environmental effects.
10. The conclusions and assumptions in the DEIR are not supported by substantial evidence.

Section III discusses the multitude of legal standards the SWRCB has failed to meet.

11. The regulation is not necessary.
12. The regulation is overbroad.
13. The regulation is too narrow.
14. The regulation is not supported by the findings or the evidence.
15. The SWRCB has not proceeded in the manner required by law.
16. The SWRCB underestimates the costs that will be associated with implementation of the regulation.
17. The SWRCB is unable to meet the findings that will be necessary for the regulation to pass OAL review and survive legal challenge.

Basically, the administrative record lacks the factual and legal basis necessary to adopt and implement the proposed regulation. The SWRCB has also failed to adequately disclose the environmental and economic impacts associated with the regulation. As a result, the proposed regulation threatens to put many wine grape and pear growers out of business, impose substantial unnecessary costs on those who can remain in business, create unmitigated environmental impacts, generate reams of unusable "scientific" data, and not save a single fish.

We encourage the SWRCB to abandon its top-down regulatory approach and allow the collaborative efforts already underway, and extremely effective, in Sonoma and Mendocino counties to continue.

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I. AUTHORITY TO ENACT REASONABLE USE REGULATIONS

The SWRCB asserts the public trust doctrine and the reasonable and beneficial use doctrine as the legal authority for the proposed regulation:

> The State Water Board has a duty to protect, where feasible, the State's public trust resources, including fisheries. The State Water Board also 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.[1]

Using this authority, the SWRCB asserts that an entire purpose of use—frost protection in the 1485 square mile Russian River watershed—is unreasonable based on two cases of alleged frost protected related stranding and a study that documented stage changes in <u>*one*</u> stream.

Yet these allegations, and this single study on a single stream, do not fulfill the prerequisites for enacting a reasonable use regulation pursuant to the public trust doctrine and Article X, Section 2 of the California Constitution because the SWRCB does not have actual evidence of harm caused by frost protection water diversions. Evidence of actual harm is required to make the necessary factual and legal findings to conclude that water use for frost protection in the Russian River watershed is an unreasonable use of water unless managed in accordance with a water demand management plan. The SWRCB cannot unilaterally declare an entire method of water use unreasonable with no evidence, or a suspicion based upon a mere presumption of harm only. Although the proposed regulation might provide the SWRCB the information necessary to make reasonable use determinations for individual water diversions in the future, it cannot adopt a regulation based on an unsubstantiated assumption alone. Accordingly, the SWRCB lacks the legal authority to adopt the regulation with the evidence presently in the record.

While the SWRCB may appeal to the Napa River frost regulation as regulatory "precedent" for the Russian River frost regulation, the proposed Russian River frost regulation differs substantially from the Napa River frost regulation in that the SWRCB had actual evidence that the supply of water in the Napa River was inadequate to accommodate the demand for all water rights during frost protection. As a result, the SWRCB "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."[2]

[1] *Draft* Initial Statement of Reasons, May 3, 2011, at p. 2.
[2] *Draft* Initial Statement of Reasons, May 3, 2011, at p. 4.

II. DISCUSSION OF DRAFT EIR

1. The Project Purpose and Project Description are Defined So Narrowly That They Prohibit Consideration of a Reasonable Range of Alternatives.

The DEIR must include a clearly written statement of objectives to help the SWRCB develop a reasonable range of alternatives to evaluate in the EIR.[3] Further, the EIR must analyze a reasonable range of alternatives to the proposed project that would feasibly attain *most* of the project's basic objectives while reducing any of its significant effects.[4]

Commenters on the Notice of Preparation expressed concern that the basic project purpose defined in the NOP was too narrow because it would constrain the alternatives analysis by identifying only one acceptable alternative, *the proposed regulation* in the Project Description.[5]

The DEIR attempts to address this NOP shortcoming by expanding the project purpose to include the adoption of 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", but the DEIR still myopically limits the regulation to the "diversion for purposes of frost protection of crops in the Russian River watershed…"[6] This narrow objective precludes consideration of other regulation alternatives that, for example, would apply to all water use during frost protection periods that could contribute to salmonid stranding. The DEIR unreasonably limits the regulation to "water diversion for purposes of frost protection of crops" despite evidence in the record that there are multiple natural and water diversion-related causes of salmonid stranding, including other non-frost related diversions that are within the regulatory authority of the Board.[7]

The DEIR also constrains the consideration of alternatives with the following "goals":

> (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.[8]

Although the revised project objectives and goals in the DEIR may appear to be meaningful improvements at first blush, the DEIR suffers the same failing of the NOP in that it continues to constrain the alternatives analysis by ensuring that the proposed regulation is the only acceptable alternative.

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[3] Cal. Code Regs., tit. 14, § 15126.6(a). Hereinafter, all references to Title 14 of the Code of Regulations shall be to "CEQA Guidelines."
[4] CEQA Guidelines § 15126.6(a).
[5] NOP, p. 2.
[6] DEIR, p. 8.
[7] DEIR, pp. 38-40.
[8] DEIR, p. 8.

2. The DEIR's Failure to Define and Analyze the Basic Project Objective to Prevent Stream Stage Changes to Avoid Stranding Prevents Meaningful Impact Disclosure and Comparison of Alternatives.

The basic project objective is to adopt a regulation that prevents diversions for frost protection from "causing salmonid stranding mortality." The DEIR summarily concludes that "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."[9] The DEIR, however, does not define what "a reduction of stream stage that causes salmonid stranding mortality" actually is, because the DEIR acknowledges that this information will be obtained only through studies conducted by the WDMPs.[10] Without this information, the DEIR does not disclose and assess the actual impacts to streamflow and salmonids from the regulation. For example, the DEIR assumes, without evidence, that a WDMP will be effective, when in fact development of the lower limits of the stream stage to protect salmonids may result in salmonid mortality. Further, the DEIR cannot evaluate whether the project objective will be accomplished with the proposed project or alternatives.

3. The DEIR Fails to Identify Assessment Methodologies and Thresholds of Significance

Program EIRs may be "prepared on a series of actions that can be characterized as one large project and are related . . . to . . . [in] connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program."[11] Used properly, a Program EIR may "consider broad policy alternatives and program wide mitigation measures at an early time when the agency has greater flexibility to deal with basic problems or cumulative impacts."[12] Although focused on a regulation that applies to a large geographic region, the Program EIR nevertheless must disclose and assess the impacts of the project.[13] An accurate discussion of the environmental setting, including rare or unique environmental resources in the project area, are essential for complete disclosure and analysis of a project's impacts.[14] Clear impact assessment methodologies and thresholds of significance are just as necessary for a Program EIR as they are for a site-specific project EIR.[15] The discussion of the project's impacts "should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, the human use of the land (including commercial and residential development),

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[9] DEIR p. 55.
[10] DEIR p. 15.
[11] CEQA Guidelines 15168(a).
[12] CEQA Guidelines 15168(d).
[13] Pub. Resources Code § 21068.5, CEQA Guidelines § 15160. "All EIRs must meet the content requirements discussed in Article 9 beginning with Section 15120."
[14] CEQA Guidelines § 15125(c). "Knowledge of the regional setting is critical to the assessment of environmental impacts. Special emphasis should be placed on environmental resources that are rare or unique to that region and would be affected by the project. The EIR must demonstrate that the significant environmental impacts of the proposed project were adequately investigated and discussed and it must permit the significant effects of the project to be considered in the full environmental context."
[15] See Remy, et al., Guide to CEQA (11th Ed. 2007) at 638. ("the authors believe that the agency, to be prudent, should formulate and adopt performance standards or objectives . . . that can function as 'first tier mitigation' and then be translated into site-specific mitigation measures when site-specific CEQA analysis is required".)

health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services."[16] The overgeneralization of the proposed project in order to defer impact analyses as too speculative deprives the public of the opportunity to assess the actual impacts of the regulation.[17]

The DEIR Section 6 effects analysis reduces potential impacts to mere generalities without discussion of the impact assessment methodologies or reliance on thresholds of significance.

For example, the analysis regarding the removal of surface water diversions in Section 6.4.2 concludes that, "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."[18] The DEIR justifies this simplistic conclusion on mere generalities:

> 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.[19]

The DEIR fails to discuss specific impact mechanisms and assessment methodologies, including impacts that are affected by factors not in the proposed regulation, and thresholds of significance that are essential for assessing the proposed regulation, including but not limited to the following.

Stranding can occur as a result of natural declines in flow, municipal water withdrawals, and other non-frost diversion causes.[20] The DEIR fails to discuss the extent to which the non-frost diversions may cause or contribute to stranding that occurs during frost protection periods, and whether these causes impair the effectiveness of the regulation. In short, the DEIR does not adequately analyze whether the objective of reducing stranding will actually occur.

The DEIR fails to identify what "adequate stream stage"[21] is, and therefore does not provide an analysis of impacts associated with changing stream flow and stage.

Potential beneficial impacts to biological resources of the alternatives are compared on a "net-benefit" standard rather than through analysis of actual environmental impacts to individual

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[16] CEQA Guidelines § 15126.2.
[17] CEQA Guidelines §§ 15144. ("Drafting an EIR or preparing a negative declaration necessarily involves some degree of forecasting. While foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can."), § 15145 (lead agency may defer an analysis as too speculative only "after thorough investigation").
[18] DEIR, p. 68.
[19] DEIR, pp. 68-69.
[20] DEIR p. 39.
[21] e.g., DEIR p. 125.

species. The DEIR relies on sweeping conclusions of net-benefit to avoid analysis of the varied impacts to different species: "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."[22] Such an analysis is not permissible.[23]

4. The DEIR Fails to Disclose and Analyze Significant Effects.

Construction of new reservoirs may result in increased recreation on those reservoirs. This impact is not discussed.[24]

Removal or modification of existing onstream reservoirs that provide flood control or otherwise attenuate peak flows may increase flooding and property damage. This impact is not discussed.

Removal or modification of existing water diversions may reduce the water supply, and reliability of supply, for agricultural and domestic uses dependent on those diversions. Reliability of supply for new water diversions may be affected by environmental protection (e.g., bypass flow) conditions and conditions for the protection of senior water rights. Loss of and decreased reliability of supply may reduce the quantity of lands in agricultural production. These impacts are not discussed in DEIR Section 6.4.[25]

The use of recycled water will likely increase if the regulation is adopted. The DEIR does not analyze this impact. The sole discussion of recycled water in the DEIR incorrectly concludes that the use of recycled water is not economically feasible to be done at a large scale to serve as an alternative to the project, citing one example where a regional recycled water program ("NSCARP") was not adopted by SCWA and the statement that there may not be funds available to complete a proposed Mendocino County recycled water project.[26] The large cost and uncertain standards of the regulation are likely to make these and other recycled water options relatively cost-effective and feasible.

The DEIR impermissibly uses a net-biological benefit standard to compare alternatives ("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"[27]) even though the DEIR discloses that certain measures to protect salmonids (e.g., removal of onstream diversions) may harm the habitat for non-salmonid species.[28] This approach underestimates the significant adverse effects to certain non-salmonid species including amphibians.

The reduction of water diversions for frost protection purposes during the frost protection season and other times of the year may increase the amount of water in stream for non-frost water uses. The failure of the regulation to address non-frost diversions may result in increases in non-frost

[22] DEIR p. 125.
[23] CEQA Guidelines § 15125(c).
[24] DEIR p. 68.
[25] DEIR pp. 68-72.
[26] DEIR p. 87.
[27] DEIR p. 125.
[28] DEIR p. 69.

water use, which may adversely affect salmonid and other biological resources and impair the effectiveness and feasibility of the regulation. These impacts are not addressed in the DEIR.

4a. The DEIR Fails to Disclose and Analyze Significant Effects on Agriculture.

The draft EIR did not utilize the recommended Environmental Checklist that is part of the California Environmental Quality Act Guidelines Appendix G when it evaluated the environmental impacts of the draft regulation. As a result, the draft EIR does not consider or evaluate numerous potential impacts. We repeat several questions from the Checklist here.

Will the project convert prime farmland, unique farmland, or farmland of Statewide importance, as shown on the maps prepared pursuant to the farmland mapping and monitoring program of the California Resources Agency, to non-agricultural uses?

Yes. Although the SWRCB raised the issue of farmland conversion, it quickly discounted the possibility under Section 6.9 ("Other Potential Actions Identified in the Notice of Preparation But Considered Not Likely to Be Implemented"). The SWRCB writes:

> 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 alternative.

The SWRCB apparently disregards its own economic analysis that estimates the cost of this regulation. According to the SWRCB, this regulation is expected to cost a typical 160-acre vineyard from $9,600 to $352,000 in order to initially comply with its mandates. It will cost an additional $3,000 to $36,200 per year to keep that 160-acre vineyard in compliance. It is expected to cost a typical 40-acre vineyard from $2,400 to $87,880 in order to initially comply with its mandates. It will cost an additional $750 to $9,000 per year to keep that 40-acre vineyard in compliance (see **Exhibit A**). If we look at the higher end of these expected costs, one must suspend common sense to argue small farms will not go out of business as a result of this regulation. Attached as **Exhibit B** are ten declarations from small family farms in Mendocino and Sonoma counties stating that if forced to incur these types of expenses, they will have no choice but to cease farming and possibly put the property up for sale. The DEIR fails to identify, evaluate, and mitigate the significant environmental effects associated with land conversion.

It is important to note that conversion of farmland to either housing or deep pit gravel mining is likely. Deep pit gravel mining has already taken hundreds of acres of farm land out of production along the Russian River below Healdsburg and in several locations in Ukiah. According to the Department of Conservation's California Geological Survey the Northern San Francisco Bay Area will need 647 million tons of aggregate over the next 50 years. Currently only 46 million tons are available through permitted sites. This discrepancy combined with the high yields of aggregate found in the floodplain valleys of the Russian River make farmland to pit mine conversion a very likely possibility. None of these significant effects were analyzed or mitigated in the DEIR.

Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

Yes. Under the Williamson Act, landowners promise to keep land in agriculture in return for a substantial reduction in real estate taxes. The Act is clear that land must be retained in agriculture and from time to time a county may require the landowner to document the agricultural use using receipts and inventories for crops or livestock. If the land is not kept in agricultural production, a county may initiate termination of the contract for breach of contract, which subjects the landowner to a significant penalty and loss of tax benefits. With the effective elimination of State open space subventions to counties since fiscal year 2009/2010, the counties have greater incentive to terminate Williamson Act contracts due to nonproduction.

It is likely that many landowners will be unable to assume the costs of the draft regulation and will have to let land lie fallow, or sell it. If that land is covered by a Williamson Act contract, the landowner may no longer be able to conform to the terms of the contract due to loss of water essential to successful farming. As a consequence, a county has the authority to terminate the contract based on noncompliance. The landowner in turn, no longer being under the obligations of the Williamson Act and faced with the burden of much higher property taxes and a termination penalty, may subdivide and sell the land for development, which will lead to many significant impacts. Therefore, the draft regulation is likely to conflict with Williamson Act contracts.

Would the project induce substantial population growth in an area, either directly or indirectly?

Yes. The regulation will cause land to be taken out of production. If water becomes unavailable for frost protection, and growers are unable to acquire alternative forms of frost protection, there is a high probability that some landowners will let their land lie fallow and pull it out of production. A likely land use change would be to develop houses, especially in areas peripheral to cities, and to rural residential areas away from cities. Implementation of the regulation will therefore result in significant impacts to housing and population.

4b. The DEIR's Failure to Address SCWA's Operation of Warm Springs Dam and Coyote Dam and Rediversion for Municipal Purposes Will Frustrate the Regulation and Does not Disclose Associated Impacts.

"An EIR may not define a purpose for a project and then remove from consideration those matters necessary to the assessment whether the purpose can be achieved."[29] Here, the prevention of stage changes that strand salmonids is an objective of the proposed project, but the SWRCB excludes the largest diversion of water in the stream system from the regulation.

The DEIR and regulation unfairly give Sonoma County Water Agency (SCWA) a free pass on the theory that its diversions are "coordinated" per the terms of Decision 1610:

> 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 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**

[29] *County of Inyo v. City of Los Angeles* (1981) 124 Cal.App.3d 1, 10.

water below Coyote Dam or Warm Springs Dam does have the potential to harm salmonids, 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.[30]

The DEIR does not acknowledge that Decision 1610 obligates SCWA to maintain minimum streamflows in the mainstems of the Russian River and Dry Creek irrespective of other downstream diversions, and SCWA failed to meet its minimum streamflow obligation during the fish stranding mortality event in April 2008. Yet the record demonstrates that SCWA would not be subject to the proposed regulation, even though it has adversely affected salmonids during frost protection periods. The failure to include SCWA's diversions will impair the effectiveness of the proposed regulation, and therefore the environmental effects of the proposed regulation have been misstated.

This intentional omission of SCWA diversions from the regulation and EIR "impermissibly truncate[s]" the project.[31] The failure to include in the regulation SCWA's releases of water from Coyote Dam and Warm Springs Dam and rediversion of water by SCWA will impair the effectiveness and feasibility of the regulation and result in significant redirected impacts to frost water users and biological resources.

5. The Regulation and DEIR Mitigation Measures do not Have a Substantial Nexus to the Regulated Frost Water Use, and Accordingly are Constitutionally Invalid.

The CEQA Guidelines section 15126.4(a)(4) provides that mitigation measures must have an "essential nexus" to a legitimate governmental interest and must be "roughly proportional" to the impacts of the project:

> Mitigation measures must be consistent with all applicable constitutional requirements, including the following:
>
> (A) There must be an essential nexus (i.e. connection) between the mitigation measure and a legitimate governmental interest. *Nollan v. California Coastal Commission*, 483 U.S. 825 (1987); and
>
> (B) The mitigation measure must be "roughly proportional" to the impacts of the project. *Dolan v. City of Tigard*, 512 U.S. 374 (1994). Where the mitigation measure is an ad hoc exaction, it must be "roughly proportional" to the impacts of the project. *Ehrlich v. City of Culver City* (1996) 12 Cal.4th 854.

The DEIR would impose substantial costly requirements on hundreds of frost water users on the unsubstantiated assumption that their actual diversions are adversely affecting stream stage and salmonids. The rationale is that this class of diversion is presumptively "unreasonable." The SWRCB does not have evidence of a water diversion's specific, particular harm and unreasonableness. Accordingly, there is no nexus between the regulation's and DEIR's exactions on water use. The DEIR mitigation measures are not "roughly proportional" to the

[30] DEIR p. 16 (emphasis added).
[31] *County of Inyo v. City of Los Angeles* (1981) 124 Cal.App.3d 1, 10 (holding that the misleading data about the quantity of water that would be exported versus used within the region is an "'impermissibly truncated' project definition [that] severely distorted not only the critical project but the alternatives to the project.").

actual impact of water use because the actual impacts on stream stage and species are not known.[32]

6. The DEIR Mitigation Measures are not Feasible.

Throughout the draft EIR, the SWRCB identifies several potentially significant impacts. For example, the regulation could result in:

- Increased groundwater extraction and use.
- Construction of new or expansion of existing offstream storage facilities.
- Modification or removal of surface water diversion structures.
- Use of wind machines.
- Installation and operation of orchard heaters.
- Installation of USGS stream gauging stations.

For each of these potentially significant impacts, the SWRCB's mitigation is nearly identical: "Project proponents will comply with any mitigation measures imposed by (*fill in the blank*)." Depending upon the context, this is not mitigation. This is deferral of mitigation without standards.

In many cases, a Lead Agency may require "compliance with environmental regulations [a]s a common and reasonable mitigating measure."[33] However, this approach is permissible only when the agency has "meaningful information reasonably justifying an expectation of compliance."[34] With regard to several of the mitigation measures, the SWRCB has no "meaningful information" that reasonably justifies an expectation of compliance.

For example, with respect to groundwater pumping, the SWRCB states in mitigation measure GW-MM-1 that "groundwater pumpers shall comply with any mitigation measures imposed by state and local agencies to mitigate potentially significant impacts associated with action taken in response to the regulation." The problem with this "mitigation measure" is that the SWRCB has not identified a regulatory agency that will be responsible for mitigating any significant impacts. The SWRCB has no meaningful information that reasonably justifies an expectation of compliance with this mitigation measure. The mitigating agencies, and therefore the measures, are purely fictional. The same is true of GW-MM-2 and GW-MM-5. As such, this regulation could result in significant unmitigated impacts to aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology, hazardous materials, hydrology, land use and planning, noise, transportation, utilities services, groundwater depletion, saltwater intrusion, degradation of groundwater quality, land subsidence, and aquifer overdraft.

There is a similar problem with the mitigation measures for the use of wind machines (WM-MM-1, WM-MM-2). The installation, operation, and maintenance of such facilities are not regulated by any identified agency and therefore the impacts from their use will not be mitigated. As a result, this regulation could result in significant unmitigated impacts to air quality, biological resources, cultural resources, geology, hazardous materials, hydrology, land use and planning, noise, traffic, utilities, and aesthetics.

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[32] *Nollan v. California Coastal Comm'n* (1987) 483 U.S. 825, *Dolan v. City of Tigard* (1994) 512 U.S. 374.
[33] *Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 308, 248 Cal.Rptr. 352.
[34] *Id*.

7. The DEIR Improperly Defers Development of Mitigation to a Later Time.

The WDMP, the central element of the regulation, is a form of mitigation to be developed after the EIR. It is impermissible to defer discussion and analysis of this critical mitigation.[35] The DEIR does not define what acceptable stage means and how a WDMP would develop a plan for ensuring acceptable stage, and accordingly the DEIR is flawed for failing to define this mitigation in the DEIR.

8. The Mitigation Measures are Overbroad and May Cause Significant Redirected Impacts.

The DEIR mitigation measures themselves have significant redirected impacts due to extensive cost of compliance. For example: measure OFS-MM-6 would require obtainment of a permit or waiver from the Army Corps of Engineers for wetland impacts without any reason to presume that a project will affect wetlands:

> 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.[36]

The Army Corps of Engineers will not provide a letter that a permit is not needed without the water diverter completing a wetland survey called a "jurisdictional determination," a report that often costs tens of thousands of dollars to prepare. In practice, an environmental consultant will not undertake such an effort unless required in his or her professional judgment. The added cost of compliance for this unnecessary mitigation measure was not included in the economic analysis.[37] This added cost will increase the financial pressure on agriculture and result in additional conversion of agricultural land to non-agricultural purposes. These impacts were not analyzed in the DEIR.

Other mitigation measures are undefined and overbroad such that the impacts associated with compliance cannot be assessed. For example:

> 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-

[35] *Id.* at 306-308 (EIR improperly assumed sludge disposal would be available despite evidence in record of lack of disposal site).
[36] DEIR p 106.
[37] See Appendix D to DEIR.

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.[38]

These mitigation measures may themselves have significant impacts or may be so costly to comply with that they result in additional conversion of agricultural land to non-agricultural purposes.

9. The DEIR Improperly Rejects and Does Not Consider Feasible Alternatives with Fewer Environmental Effects.

CEQA requires an EIR to evaluate "alternatives that might eliminate or reduce the Project's significant adverse environmental effects."[39] There is a four-part test for suitable alternatives discussed in an EIR. Potential alternatives are reviewed to determine whether they:

1. can substantially reduce significant environmental impacts
2. can attain most of the basic project objectives
3. are potentially feasible
4. are reasonable and realistic[40]

An alternative need not fully satisfy all project objectives/purpose. The CEQA Guidelines provide that an alternative need only feasibly attain most of the project's basic objectives while reducing any of its significant effects.[41]

The DEIR correctly concludes that, other than the no action alternative, the "local stakeholder voluntary programs" alternatives are environmentally superior to the proposed project.[42] The DEIR impermissibly rejects these environmentally superior alternatives: "[n]either of these two alternatives however, fully meets the basic project objective of preventing salmonid stranding mortality."[43] A DEIR cannot reject an alternative because it does not "fully" meet the project objectives, where those objectives were drawn so narrowly as to reject all but the proposed project.[44] The SWRCB attempts to reject the local stakeholder voluntary programs alternatives by narrow criteria:

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38 DEIR p. 112 (emphasis added).)
39 *Friends of the Eel River v. Sonoma County Water Agency* (2003) 108 Cal. App. 4th 859, 873 134 Cal.Rptr.2d 322.
40 14 Cal. Code Regs. § 15126.6(c).
41 See Guidelines section 15126.6(a).
42 See DEIR p iii ("Among the remaining alternatives, the environmentally superior alternative is the local stakeholder voluntary programs.").
43 DEIR p iii.
44 *See City of Santee v. County of San Diego* (1989) 214 Cal.App.3d 1438 (holding that when project objectives are defined too narrowly an EIR's treatment of analysis may also be inadequate). See also Remy, et al, Guide to CEQA, p. 589 ("overly narrow objectives may unduly circumscribe the agency's consideration of project alternatives.")

> 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.[45]

The DEIR could have made three simple additions to the local stakeholder voluntary program alternative – mandatory participation, transparency of information, and enforcement by the State Board – that would preserve the environmentally beneficial aspects of the alternative while addressing State Board objectives and goals. The local stakeholder voluntary programs with the above changes should be adopted as the preferred alternative and proposed project in the Final EIR.

The DEIR failed to evaluate the proposed alternative to regulate all diversions during the frost protection period.[46] As stated above, the failure to include the release of water and rediversion by SCWA will impair the regulation and result in unanalyzed environmental impacts. By comprehensively addressing all water diversions this proposed alternative regulation would feasibly attain *most* of the project's basic objectives while reducing any of its significant effects because it would be more effective in managing stream stage and preventing salmonids stranding.[47]

The DEIR failed to evaluate the proposed alternative to exclude from the regulation diversions of water from the mainstem Russian River and Dry Creek below the large municipal reservoirs. These stream reaches are already managed according to State Board-imposed minimum stream flows.[48] By excluding diversion of water from the regulated mainstem rivers that does not have an instantaneous adverse effect on stream stage, and thereby reducing the cost of compliance for a large number of mainstem water diverters, this proposed alternative regulation would feasibly attain *most* of the project's basic objectives while reducing many of its significant effects.[49]

The DEIR failed to evaluate the proposed alternative to exclude from the regulation the pumping of groundwater. The pumping of groundwater does not have an instantaneous effect on stream stage.[50] By excluding groundwater pumping that does not have an instantaneous adverse effect on stream stage, and thereby reducing the cost of compliance for a large number of groundwater

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[45] DEIR p. 90.
[46] See Mendocino County Farm Bureau *et al*. Scoping Comments, p. 7.
[47] CEQA Guidelines § 15126.6(a).
[48] See Mendocino County Farm Bureau *et al*. Scoping Comments, p. 7.
[49] CEQA Guidelines § 15126.6(a).
[50] See Mendocino County Farm Bureau *et al*. Scoping Comments, p. 7.

pumpers, this proposed alternative regulation would feasibly attain *most* of the project's basic objectives while reducing many of its significant effects.[51]

The DEIR also fails to consider reducing the intensity or scope of the regulation, which would necessarily reduce all of the regulation's significant environmental impacts.

There is no evidence in the record to support the SWRCB's conclusion that the less restrictive alternatives will not achieve the program's objectives. In fact, all of the evidence in the record indicates that program objectives are addressed very effectively without a regulation in every instance where stranding mortality is known to occur. The possible effects of diversions for frost protection on the stranding events on both Felta Creek and the mainstem of the Russian River near Hopland were resolved. Furthermore, numerous improvements have been made in locations where no stranding occurred, but where there were concerns that diversions for frost protection could be harmful. These facts, thoroughly documented in the record, completely contradict the SWRCB's assertion that the project objective cannot be achieved through less restrictive alternatives.

10. Conclusions and Assumptions in the SWRCB draft EIR are not Supported by Substantial Evidence.

Many of the conclusions and assumptions in the draft EIR are not supported by substantial evidence. For example, Page 57 of the draft EIR describes a NMFS GIS layer "Potential Stranding Sites." This layer was then used in conjunction with a layer titled SWRCB Water33.sde "USDA Prime Imagery" to determine the location and acreage of vineyards upstream of "potential stranding sites."

The NMFS stranding layer shows portions of tributary creeks distributed throughout the Russian River watershed. The metadata for the potential stranding layer states:

> *The criteria used to select these locations included proximity to vineyards, presence of salmonids, and presence of Intrinsic Potential habitat. Stream segments that intersected vineyard footprints or were adjacent to the vineyards, have documented salmonid presence, and have salmonid Intrinsic Potential habitat were extracted. Intrinsic potential measures the potential for development of favorable habitat characteristics as a function of the underlying geomorphic and hydrological attributes, as determined through a Digital Elevation Model (DEM) and mean annual precipitation grid. The model does not predict the actual distribution of "good" habitat, but rather the potential for that habitat to occur, nor does the model predict abundance or productivity. Additionally, the model does not predict current conditions, but rather those patterns expected under pristine conditions as related through the input data. Thus, IP provides a tool for examining the historical distribution of habitat among and within watersheds, a proxy for population size and structure, and a useful template for examining the consequences of recent anthropogenic activity at landscape scales.*

It is important to emphasize that the "Intrinsic Potential Model" identifies general stream conditions good for salmonids under "pristine" conditions. Further, this model uses a Digital

[51] CEQA Guidelines § 15126.6(a).

Elevation Model (DEM) which has a resolution of 1 pixel = 10 meters or 32.8 feet. This means that no topographic feature smaller than 10 meters is part of the model. The creeks evaluated with this method rarely have salmonid habitats (riffles, pools, gravel bars) larger than 10 meters in length. Additionally, the DEM is created from USGS topographic maps typically at a scale of 1:24,000. These maps were originally created using photogrammetric methods from aerial photos and involve very little field verification. This general level of topographic data and mean annual precipitation data were then used with another GIS layer (SWRCB Water33.sde) that is not accessible to the public but can be assumed to be vineyard areas to create a map of "potential stranding areas." The only criterion used was vineyards near stream channels. No information regarding water sources or even if water is used for frost control was included.

According to the NMFS accounts of the 2008 strandings on the Russian River near Hopland, 10 one-inch steelhead were stranded in three to six-inch gravel and cobble due to a 1cm/hr drop in water stage. An analysis using data layers with a resolution of 32.8 feet and a model that looks at landscape scale patterns in creeks cannot be used to predict where stranding will occur due to such miniscule changes in stream stage. This is an example of a generalized, largely data-free analysis. This analysis was created to justify the assumption that the incident, which occurred in 2008, in a drought year with a very cold spring, occurred over a much larger area. The potential stranding GIS layer is an inadequate database to determine the acreage of vineyards that may cause stranding and therefore are affected by the frost regulation.

On a related note, page 6 of the Statement of Reasons requires a detailed site-specific approach "for determining the stream stage that would prevent stranding mortality on gravel bars, side channels and pocket pools along river margins." This approach requires site specific transects at potential stranding locations and stream flow gauging. If this level of site specific evaluation is required to demonstrate stranding potential, how is it that NMFS can judge this feature of the Russian River channel with no site specific field work? Further, how is it that NMFS can determine stranding potential using GIS layers with a 10-meter resolution?

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III. DISCUSSION OF REGULATION

In addition to the defects in the SWRCB's draft EIR, the SWRCB has failed to meet a variety of legal hurdles necessary to adopt a regulation of such broad scope and consequence.

11. This Regulation is Not Necessary

In order to adopt this regulation, the SWRCB must find that the regulation is legally "necessary." The necessity must be supported by "substantial evidence." Government Code section 11350 provides:

> (a) Any interested person may obtain a judicial declaration as to the validity of any regulation…by bringing an action for declaratory relief in the superior court in accordance with the Code of Civil Procedure….The regulation…may be declared invalid for a substantial failure to comply with this chapter….
>
> (b) In addition to any other ground that may exist, a regulation…may be declared invalid if either of the following exists:
>
>> (1) The agency's determination that the regulation is reasonably necessary to effectuate the purpose of the statute, court decision, or other provision of law that is being implemented, interpreted, or made specific by the regulation is not supported by substantial evidence.

"Substantial evidence" has been defined in the administrative context as "relevant evidence that a reasonable mind might accept as adequate to support a conclusion," or "evidence of ponderable legal significance…reasonable in nature, credible, and of solid value."[52]

In addition, the Office of Administrative Law (OAL) must agree with the SWRCB's determination. Government Code section 11349.1 provides:

> (a) The office shall review all regulations adopted…and submitted to it for publication in the California Code of Regulations Supplement…and make determinations using all of the following standards:
>
>> (1) Necessity
>> * * *

In various documents related to this regulation, including the draft EIR, and the draft Initial Statement of Reasons, the SWRCB states that the "necessity" for the regulation is based upon a letter dated February 19, 2009, from NMFS, which requests that the SWRCB take immediate action to address concerns that high instantaneous demand for water for frost protection contributes to significant salmonid mortality. NMFS based this letter upon two alleged strandings that occurred in 2008, one on the Russian River mainstem near Hopland and one on Felta Creek, a small tributary to the Russian River in Sonoma County. Of these two strandings, NMFS claims 10 fish were found stranded in the mainstem Russian River below Hopland, and 31 fish were found stranded on Felta Creek, a tributary of the Russian River. While every reasonable effort should be made to preserve endangered species, the regulation being offered by the SWRCB is legally unnecessary because it will do <u>nothing</u> to preserve the endangered salmonids in the Russian River watershed. As such, it is not supported by "substantial evidence"

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[52] 1 Cal. Administrative Mandamus (Cont.Ed.Bar 3rd ed. 2010) §6.171, p. 298.

for the reasons outlined below.

The first reason this regulation is not necessary is that the real cause of the drop in streamflow in April of 2008 near Hopland was the failure of the Sonoma County Water Agency (SCWA) to comply with the terms of its water right permits. In Decision 1610, the SWRCB made the following term a part of SCWA's permit 12947A:

> 18. For the protection of fish and wildlife, and for the maintenance of recreation in the Russian River, permittee shall pass through or release from storage at Lake Mendocino sufficient water to maintain:
> ***
>
> (B) The following minimum flows in the Russian River between the East Fork Russian River and Dry Creek:
>
> (1) [During normal water years]
> From April 1 through May 31 185 cfs

However, during the entire month of April, SCWA failed to meet this permit term on 24 of the 30 days, with one day, April 21, supplying a flow of only 123 cfs, or only 66% of the required amount. Please see attached as **Exhibit C** the CDEC report of daily discharge on the Russian River at Hopland during the month of April 2008 and a graph, generated by CDEC, showing that the SCWA failed to meet its permit term 80% of the time during the month of April, yet no enforcement actions have been taken against SCWA.

While many diversions may exist between the East Fork of the Russian River and Hopland, the SCWA is still required to meet these flow requirements. Section 15.14, page 44, of D-1610 provides as follows:

> Mendocino Improvement District asserted in the hearing that landowners within its service area have non-appropriative or riparian water rights. We note that all of SCWA's permits herein are subject to any prior water rights. Consequently, if the landowners have any water rights in addition to those appropriative rights issued by this Board that are senior to SCWA's, such rights are not impaired by this decision.

Put differently, SCWA must meet its minimum instream flows regardless of other senior and riparian diverters on the system. This position is bolstered by the fact that on page 41 of D-1610, the SWRCB removed permit term 68 for other post-1949 appropriative water rights (which prohibited these diverters from diverting when the only water in the system matched SCWA's releases) and made SCWA solely responsible to meet the instream flows stipulated between it and the Department of Fish and Game. Therefore, why is the SWRCB imposing this regulation on frost diverters when the SCWA is obligated under D-1610 to meet instream flows?

The second reason this regulation is not necessary is that whatever strandings may have occurred do not justify the basis for the regulation. Based upon the results of several Public Records Act requests and Freedom of Information Act requests, the regulation is based upon two strandings—both in 2008. Without minimizing NMFS' claim that 41 endangered fish were lost, but based upon these 41 fish, the SWRCB has proposed a regulation that spans 1,778 miles of stream systems, or 1,485 square miles in two different counties, that is conservatively projected to cost $10 million over three years.[53] This is a grossly disproportionate and unreasonable response that

[53] See Table 4.12, Economic Impacts of the Proposed Russian River Frost Regulation, May 2, 2011, Appendix D to the SWRCB draft EIR.

will do nothing to improve habitat conditions for fish, particularly when any contribution diversions for frost protection may have had on the only two documented instances of stranding have been fully resolved.

Recognizing the lack of justification for such a broad regulation, and in an effort to undermine the remedial actions undertaken by wine grape growers to address the strandings, NMFS has developed a paper, Biological Context of the Spring 2008 De-Watering Event in the Upper Mainstem of the Russian River, dated March 2011 (see **Exhibit D**) (the "NMFS Document"). NMFS alleges in this document that the 10 steelhead fry found stranded in the Russian River in 2008 actually mean 25,872 fish were stranded. The NMFS Document is unsigned and provides no references or bibliography to support the assumptions or conclusions within it. The methodology employed in the NMFS Document is without merit for several reasons.

- One of the assumptions employed in the NMFS Document is that a stage change of 1 centimeter per hour caused the stranding of the steelhead fry, but no reference is made that would justify that statement. In fact, published data on the subject suggests that a stage change of up to one inch (2.4 centimeters) per hour is safe to prevent stranding of steelhead fry (Hunter 1992)(see page 8 of **Exhibit E**). This same study was incorporated into the Biological Assessment for Flood Control Operations at Coyote and Warm Springs Dams and represents the best available science on stage changes (see **Exhibit F**).
- The NMFS Document assumes 25 percent of the Russian River channel is uniform enough to cause stranding, yet the Russian River is not uniform in width to depth ratio, sinuosity or bed composition over the 28 miles in question. Extensive fieldwork is needed to document where conditions mimic those found just downstream of the USGS Hopland Gage and have the same hydrologic impacts. The Hopland gage is located in a nearly straight, partially confined channel in order to provide the best conditions for stream flow measurement. The downstream gravel bar where the stranding occurred is in this straight section. This reach is not representative of most of the 28 miles of the Russian River channel.
- The Hopland gage is midway on the 28-mile reach and the 1cm/hr stage change is the result of cumulative water diversion along the 14 miles upstream of the gage. It is incorrect to assume that a 1cm/hr stage change occurred in other upstream areas without completing a detailed hydrologic and hydraulic modeling analysis.
- The field notes from the NMFS biologist note that the juveniles were stranded in relatively large gravel/cobble of 3-6" rocks. It may be that these large cobbles block the ability of the small juvenile fish to swim to deeper water. The microtopography of the particular gravel bar may be a major factor in where juvenile salmonids strand. The field notes indicated the NMFS biologist looked for stranded salmonid juveniles for about an hour but no others were found, making the cobble size a likely cause of the problem.
- In the "Potential Stranding Layer" created by NMFS, none of the 28 miles of the Russian River is shown. It is not clear if the river channel was included in the analysis or if there is a major contradiction between these two evaluations.

Surprised by the lack of supporting documentation for the NMFS Document, we contacted David Hines of NMFS, who admitted being the primary author of the document. As he was the primary author, we requested supporting documentation for the assumptions and conclusions made in the paper. His answer was that he had no supporting documentation for the assumptions and conclusions. Please see **Exhibit G**, which documents our conversation with Mr. Hines. Aware that the SWRCB had posted the NMFS Document on its website as part of its rulemaking file, and that it was therefore intending to rely upon it as justification for the regulation, we had this paper reviewed by Wagner & Bonsignore, Consulting Engineers, and Douglas Parkinson, a fishery biologist.

Based upon Wagner & Bonsignore's analysis, the NMFS Document provides assumptions and conclusions that are not supported by any evidence in the record (see **Exhibit H**). Specifically:

- based upon the observations: the number of fish assumed to be stranded is 5 per hundred feet, not 10 per hundred feet;
- the authors assume a linear relationship between stage height and the observed fish mortality rate, which is unsupported by any observation;
- the authors assume that 25 percent of the 28 miles of river reach is stranding habitat, but such assumption is not supported by any observation;
- the assumptions made in the NMFS Document were not based on any scientific protocol or discernible basis;
- although 10 fish were found stranded, there is no evidence or context to assume the stranding was the result of a stage change due to frost diversions or some other cause;
- the SWRCB regulation proposes an impossible standard to comply with since it does not consider other possible causes of stranding.

Douglas Parkinson visited the stranding site and numerous other locations on the Russian River for three days and was unable to corroborate any of NMFS' assumptions or conclusions (see **Exhibit I**). Of note:

- the assumption that there was an average stranding density of ten fish per 100 feet appears without merit; and,
- the assumption that 25% of a 28-mile stretch of the Russian River provided habitat features similar to the Hopland stranding site is unsupported and unreliable.

Since none of NMFS' assumptions or conclusions can be verified, it should not be used as evidence of anything in the administrative record, except for the lack of science supporting the need for the regulation and NMFS' inability to convert meters into feet.

The third reason this regulation is not necessary is that the whole need for the regulation has been fabricated. If a regulation was truly necessary, it would not have been necessary for NMFS and the Division of Water Rights to jointly develop a basis for the regulation, while at the same time ignoring SCWA's permit violations. As discussed above, the SWRCB states that the need for the regulation is based upon a letter dated February 19, 2009, from NMFS. The problem with this letter is that it is the product of NMFS ignoring its enforcement duties and instead allowing an existing Section 7 consultation to be completed, and the Division of Water Rights deciding to override an effective collaborative process so that it may expand its jurisdiction.

The following timeline shows that NMFS' early efforts at solving the problem via collaboration were scuttled by select staff from the Division of Water Rights and NMFS in an effort to use the strandings to justify the expansion of their jurisdiction. This was accomplished by keeping evidence unavailable to stakeholders, exaggerating the extent of the issue, and creating contrived regulatory pressure between NMFS and the Division of Water Rights.

This timeline was constructed from information gathered from multiple FOIA requests. This timeline follows the events that surrounded the 2008 occurrence on the main stem of the Russian River near Hopland.

On April 20, 2008, NMFS biologist Tom Daugherty finds steelhead fry stranded near the mouth of McNab Creek and reports his observation to Special Agent (SA) Dan Torquemada:

From: Tom.Daugherty@noaa.gov
Sent: Monday, April 21, 2008 10:12 AM
To: Dan.Torquemada@noaa.gov
Subject: Russian River steelhead fry

Attachments: 100_1657.JPG; 100_1665.JPG

100_1657.JPG (2 MB) 100_1665.JPG (782 KB)

Dan,

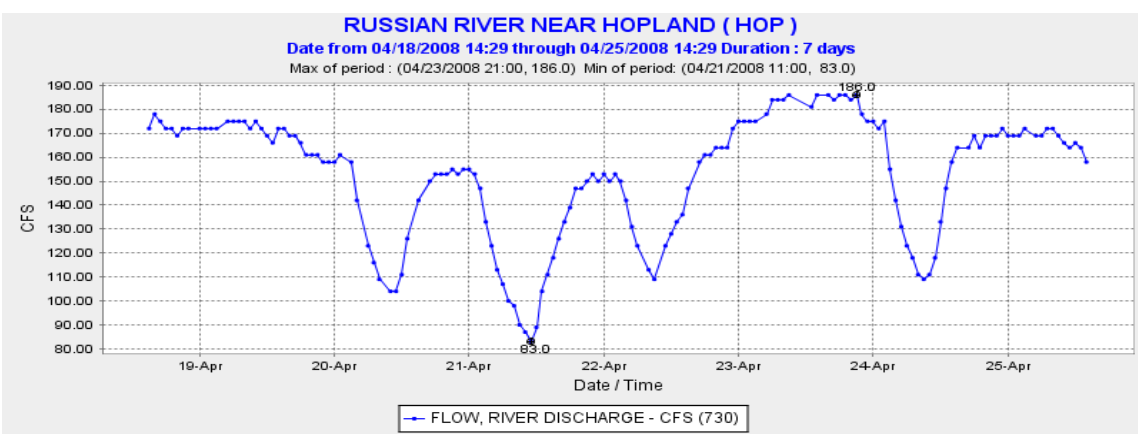
attached are a couple of pics of my observations on 4-20-08. I will put all of my info together and drop it off to you this wednesday if thats ok.   td

Although 10 fish were found, there is no real evidence indicating the cause; instead, it is simply assumed to be due to a drop in stream stage. Within one day of the initial observation, SA Torquemada declares the issue to be "one of the biggest abuses of water in our region":

From: Dan Torquemada
Sent: Tuesday, April 22, 2008 3:40 PM
To: Derek Roy
Cc: Don Masters; Martina Sagapolu; Dayna Matthews
Subject: Frost Protection Pumping

Derek,
There was another very significant frost event yesterday that resulted in a fish kill (listed steelhead), this time on the upper Russian River (main stem) near Hopland/Ukiah. This is a very complicated issue, as there are many landowners that pump directly from the Russian River for frost protection, for both vineyards and pear orchards. These events can be sporadic, and in some years, depending on spring precipitation, they don't occur at all. Nonetheless, frost protection pumping continues to be one of the biggest abuses of water in our region, and a major problem for listed fish. The problem can no longer be ignored. I have requested assistance from HCD, and would like you to work with Stacy Li

NMFS does not allow anyone to see the data collected by Mr. Daugherty under the premise that the information is part of an "on-going investigation." In lieu of the actual field data, the output from the USGS gage at Hopland becomes the iconic image representing the issue:



Following the events of April 2008, NOAA and CDFG discuss responsibility:

Derek Roy

From: John Mullin
Sent: Thursday, July 31, 2008 7:55 AM
To: Derek Roy
Subject: Re: take

Isn't SCWA responsible for maintaining adequate/mandated flows? It seems like this could have been prevented by close monitoring of the Hopland gauge. I know it takes 4 hours for a Coyote releases to reach Hopland; but they reacted at least 24 hours late.

Although Sonoma County Water Agency (SCWA) is legally responsible for maintaining stream flows, no regulatory pressure is asserted against SCWA. In 2008, SCWA was working with Bill Hearn at NMFS to complete its decade-long Section 7 Consultation. Rather than investigate the underlying cause of the ESA violation, and appropriately incorporate that violation into the Section 7 Consultation, SA Torquemada effectively quashes any investigation. In an email to Dick Butler, SA Torquemada addresses Bill Hearn's concerns about his enforcement efforts:

Dan Torquemada

From: Dan Torquemada
Sent: Tuesday, December 02, 2008 12:14 PM
To: Dick Butler
Subject: Re: Meeting With SWRCB

will move forward with this project. As discussed in past coordination meetings with you and others, OLE will not intentionally pursue an investigation that will interfere with an ongoing consultation by anyone on your staff.

I hope this information helps. Feel free to call me or come to my office anytime if we need to discuss this further.
Dan

SA Torquemada then forms the "Frost Protection Taskforce (FPT)". The FPT is directed to deal with the issue collaboratively, instead of via enforcement:

Dan Torquemada

From: Dan Torquemada
Sent: Tuesday, December 02, 2008 12:14 PM
To: Dick Butler
Subject: Re: Meeting With SWRCB

Dick,
Here's some background. Seven months ago, following the extensive frost protection and subsequent fish kills on the Russian River, I asked Derek Roy to look into this ongoing problem. He has done a fantastic job, and I am very impressed with both his enthusiasm and organization skills, especially when you consider that he has just started his career with OLE. Unfortunately, I was off work 5 months, and part time the past 2 months due to a serious health issue I am dealing with. Yesterday was my first involvement with the group.

Our agents have been directed by top SWD management to employ a collaborative approach when dealing with this type of problem due to a past investigation in the Northwest that left NOAA with a black eye.

Under the direction of SA Torquemada, SA Derek Roy organizes several FPT meetings in the fall of 2008. By December 2008, the spirit of collaboration begins to foster "on the ground solutions" to the issue:

From:	Derek Roy [derek.roy@noaa.gov]
Sent:	Monday, December 15, 2008 10:16 AM
To:	Tracie Nelson; Wayne Austin Welch; dwilson@dfg.ca.gov; Corinne Gray; Call Nicholas; Bryan McFadin; Sean White; slotad@co.mendocino.ca.us; Dan Torquemada; mking@tu.org; Matthew J Deitch; sriske@dfg.ca.gov; John Mullin; Andrew Baker; jlaugesen@dfg.ca.gov; Tom Daugherty; Jeremy Sarrow; David Hines; David_Koball@B-F.com; carrebrown@pacific.net; Joseph.J.Dillon@noaa.gov; deitch@cemar.org; mbowen@scc.ca.gov; bjohnson@tu.org; Brian.Cluer@NOAA.GOV; William Hearn; Vicky Whitney; Call Nicholas
Subject:	Re: Frost Prevention task Force Meeting

0930 at the Santa Rosa Federal Building, 777 Sonoma Ave Santa Rosa, CA, in room 215. We will have our draft of the protocol outlining the reporting requirements for the industry for the group to review. We will also have some good candidates for off stream storage identified. I am also creating a mission statement for the group so we can document our long and short term goals and make sure we stay on track to achieve them. I know we also

However, the scope and attendance of the FPT begin to expand. Notably, Ms. Vicky Whitney of the California State Water Resources Control Board, Division of Water Rights, becomes involved. Shortly after her involvement, and despite the on-the-ground progress of the FPT and OLE directives, the tenor of the FPT changes from collaboration to regulation:

From:	William Hearn
Sent:	Thursday, February 12, 2009 5:55 PM
To:	Dan Torquemada; Dick Butler
Subject:	Re: Frost Meeting

Dan Torquemada wrote:
> Bill,
> Sorry you weren't able to stay for the entire meeting yesterday.
> After you left, we had a very good meeting with the other agency
> personnel only. Vicky Whitney got her counsel on the conference line
> (Andy Sawyer), and we had a discussion regarding potential emergency
> regulations for this year. We will be moving forward with an
> enforcement "offshoot" task force and monitoring plan. Whitney has
> offered for her agency to take the lead in this effort, but we are

With this new focus, NOAA Water Rights Specialist David Hines also becomes involved:

From:	William Hearn
Sent:	Thursday, February 12, 2009 5:55 PM
To:	Dan Torquemada; Dick Butler
Subject:	Re: Frost Meeting

monitoring. Hopefully, in his new role as water rights specialist, David Hines will also be available to assist with your program.

Ms. Whitney suggests to Mr. Hines that NMFS send the SWRCB a letter requesting that emergency regulations be adopted:

From: David Hines <David.Hines@NOAA.GOV>
To: Whitney, Vicky <VWHITNEY@waterboards.ca.gov>

Sent: 2/18/2009 11:42:43 AM
Subject: Re: Letter

Vicky Whitney wrote:
> Hi David
> I received your voice mail regarding the letter that we discussed NMFS sending us requesting we adopt emergency regulations prohibiting frost protection. I am in Utah

Shortly thereafter, NMFS sends a letter to the SWRCB urging immediate regulatory action.

> We are concerned that water diversions, that may otherwise be legal under California water law, will be causing significant salmonid mortality. We, therefore, urge the SWRCB to take immediate action, such as implementing emergency regulations, to protect this important public trust resource from further harm. If you have any questions or comments concerning the contents of this letter, please contact David Hines at (707) 575-6098.
>
> Sincerely,
>
> (for)
>
> Steven A. Edmondson
> Northern California Habitat Supervisor

Up until this point, the need for a regulation that would cover 1,778 miles of stream systems and 1,485 square miles in two different counties is based upon two isolated strandings. Recognizing the lack of justification for such a broad regulation, NMFS, CDFG, and SWRCB craft an elaborate multi-agency enforcement plan in an effort to substantiate the need for a regulation:

> **From:** Vicky Whitney
> **To:** David Hines
> **Subject:** Re: Frost Regs and Enforcement Efforts
> **Date:** Wednesday, January 20, 2010 9:49:39 AM
>
> Thanks and thanks for your help. We are still going to need NMFS assistance in developing the statement of reasons that we are required to provide to the Office of Administrative Law. Again, it is basically the problem description. THe more data, the better. I hope that the enforcement effort this spring provides additional justification.

However the hunt for a "smoking gun" was fruitless in 2009 and 2010:

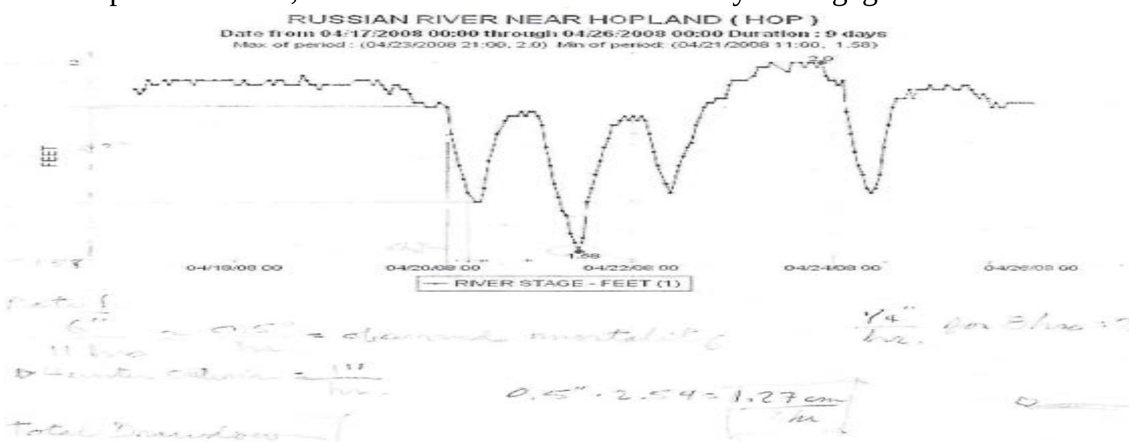
> **From:** David Hines [David.Hines@NOAA.GOV]
> **Sent:** Wednesday, April 07, 2010 11:06 AM
> **To:** Dan Wilson; Thomas Holley; Cluer, Brian; Steve Edmondson; Katherine Washburn; Macedo, Rick; Tracie Nelson
> **Subject:** Frost Survey Log
> **Attachments:** David_Hines.vcf
>
> D. Hines' Frost Survey Log, April 6:
>
> I met Corrine Gray in lower Redwood Creek at 7:30am. On my way in via Hwy 101 and Chalk Hill Road, I saw most vineyards that were set up for it, either spraying with overhead sprinklers or using wind machines.
> Corrine said most vineyards in Knights Valley were using their overhead sprinklers. Flows in both Maacama and lower Redwood were fairly high from the recent rains. I thought at first that lower Redwood might have been drawn down a couple of inches, but then could not discern the change from natural flow recession. Stage did not appear to change from 7:30am to 2:00pm. Beginning at 7:30am, we walked several hundred feet of stream and saw no evidence of fish stranding. We returned later in the day and took flow measurements and water depth

From Tracie Nelson at CDFG:

From: David Hines [David.Hines@NOAA.GOV]
Sent: Wednesday, April 07, 2010 11:06 AM
To: Dan Wilson; Thomas Holley; Cluer, Brian; Steve Edmondson; Katherine Washburn; Macedo, Rick; Tracie Nelson
Subject: Frost Survey Log
Attachments: David_Hines.vcf

Valley were frost temps actually reached during this event. I sent an email out that afternoon with greater detail of this effort. Unfortunately, I do not currently have access to this email due to an email account malfunction (temporary). No obvious effects were noted at any of the three sites. No other significant frost events followed in the Ukiah/Hopland area during the period March 15 through May 31.

During the same period of time, NMFS and DFG continue to analyze the gage data:



The analysis shows that the rate of drawdown in Hopland was substantially less than the critical drawdown rates the most stringent publications NMFS could find in their search for scientific literature and justification for the proposed regulation... (Document is from page 518 of FOIA request from NMFS):

Review of Ramping Rates

60 cm/hr: High range of Bradford 1995 study = >30% stranded (day)
>18 cm/hr: No correlation with stranding frequency in reservoirs (Bell 2008)
6 cm/hr: Low range of Bradford 1995 study = <10% stranded (day)
<5 cm/hr: "natural fluctuation in natural rivers" (Hunter 1992 in Bell 2008)
2.4 cm/hr: Threshold to avoid stranding recommended in Hunter (1992)
1.3 cm/hr: Approximate ramping rate observed at the Hopland gage on April 21, 2008
??: 2004, 2005 gage data in Maacama Creek (Deitch 2006)

Other analyses find the flow reductions observed during the frost events of April 2008 (6 to7 cfs/hour) were 75% lower than the ramping rates NMFS authorized in the 2009 Biological Opinion for the same river:

"To protect spawning gravel and juvenile salmonids within the Russian River and Dry Creek, the Corps developed interim guidelines (Corps 1998) for release changes with technical assistance from NMFS and CDFG (Table 3).

Table 3. Maximum ramping rates for CVD and WSD.

Reservoir Outflow	Down Ramping	Up Ramping
0-250 cfs	25 cfs/hour	1000 cfs/hour
250-1,000 cfs	250 cfs/hour	1000 cfs/hour
>1,000 cfs	1,000 cfs/hour	2000 cfs/hour

Moreover, the flow reductions observed during the frost events of April 2008 (6 to7 cfs/hour) were about half (one inch is equal to 2.54 cm) of the ramping rates discussed in the Biological Assessment for the Coyote and Warm Springs Dam:

Table 2-25 Rates of Stage Change Based upon Hunter (1992) and Life History Stages for Salmon and Steelhead in the Russian River

Season	Rates
March 1 to July 1	1 inch/hour
June 1 to November 1	2 inches/hour

Rather than recognize the ramping rates before and during the 2008 occurrence were well below the authorized rates, and well below the standards set by published criteria (and look elsewhere for the cause of the strandings), the SWRCB and NMFS continue to push for regulation. In response, the Upper Russian Stewardship Alliance (URSA) spearheads the development of a compensatory release program, improved gauging and a network of offstream storage reservoirs at a cost of over $5M.

The combination of tools further reduces fluctuation rates and amplitude during frost protection. However, at a November 2009 SWRCB workshop NMFS deems the efforts to be "not commensurate with the scope and magnitude of the problem."

In February 2010, the California State Farm Bureau filed a Freedom of Information Act (FOIA) request for the field data collected by NMFS in an attempt to witness the "scope and magnitude of the problem." The request was again denied under the "on-going investigation" premise.

During the same period, Congressman Mike Thompson also asks NMFS for the data. Congressman Thompson's efforts are also thwarted even though NMFS had previously identified "transparency" as an "area for improvement" (November 2009). FOIA documents hint at the actual reason for the denial:

Subject: Russian River Issues
From: "Tanya.Dobrzynski" <Tanya.Dobrzynski@noaa.gov>
Date: Fri, 12 Feb 2010 16:30:37 -0500
To: Rod Mcinnis <Rod.Mcinnis@noaa.gov>, Chris Yates <Chris.Yates@noaa.gov>, Steve Edmondson <Steve.Edmondson@noaa.gov>

Hi-

I was skiing last week while apparently this issue heated up with Thompson's office. My understanding is Jonathan Birdsong has been pushing for a report of the #s of fish killed in the 2008 and 2009 fish kills due to frost protection measures...or something like that. I have the actual #s but imagine they could spark some controversy so want to make sure they can be released.

Can we discuss this soon? Birdsong is chomping at the bit for this info. and the call btw Rep. Thompson and Dr. L last week apparently didn't go so well. Do you all have a few minutes after the Klamath briefing today?

Tanya

A year later, the nearly three-year-long "on-going investigation" is closed. Sean White of URSA asks SA Torquemada for the data. At this time, URSA is continuing to coordinate the development of offstream storage and would like to use the data to rank projects. Even though the investigation is officially closed, SA Torquemada is unwilling to share the data and directs Mr. White to file a FOIA request:

On 2/9/2011 10:47 AM, Dan Torquemada wrote:

> Sean,

> We'll need to follow standard Freedom of Information Act Protocol (FOIA).

> To do this, please contact Paula.Rohde@noaa.gov

> Best of luck.

> Dan

Mr. White requests the following:

Date/days/location of all frost-related surveys

Number of days fish not found, locations, date

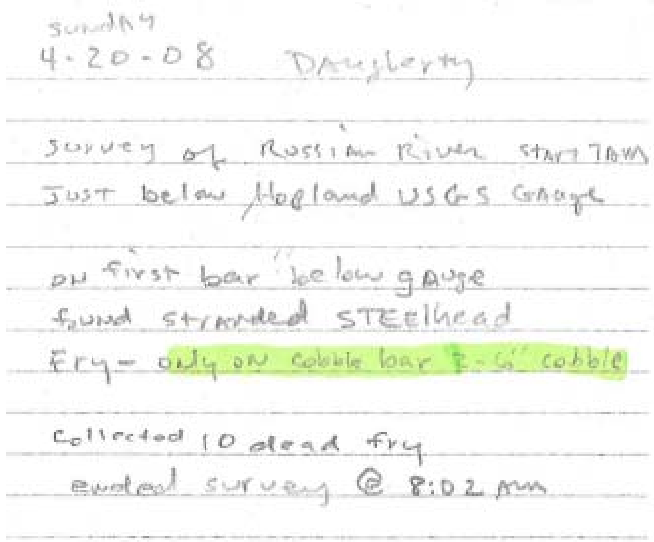
Number of days fish found, locations, life stage, condition, date

Any and all related emails

Any and all related correspondence, reports, memos, notes, or agendas

Any and all related photos or videos

Mr. White's employer, Russian River Flood Control (RRFC) pays $1636.00 in reproduction fees for the FOIA request. RRFC receives over 1500 pages of material including RRFC Board packets, unrelated material, and numerous blank pages. Buried within the materials is a single page of field data from Tom Daugherty of NMFS, and his 2008 survey. The entire effort is based on 10 juvenile fish:


Sunday
4-20-08 Daugherty

Survey of Russian River start 7AM
Just below Hopland USGS Gauge

on first bar below gauge
found stranded steelhead
Fry - only on cobble bar 3-6" cobble

Collected 10 dead fry
ended survey @ 8:02 AM

It is important to note that Mr. Dougherty specified the cobble size where the fish were stranded. Fish were not found on the more prevalent gravel bars, but in isolated areas where the topography created residual pools:

This photo taken on April 20, 2008, was used to document the “impacts” observed that day by showing the dewatered river margins, but where no fish were found:

This photo was taken on January 26, 2011, following a routine reservoir release change that was approximately 50% of the maximum rate approved by NMFS in the BO. The dewatered margin is larger than the dewatered margin attributed to frost:

Knowing that the FOIA request would reveal that the entire effort was based on a one-time observation of 10 juvenile steelhead, NMFS attempts to magnify the 2008 occurrence by preparing the ***Biological Context of the Spring 2008 De-Watering Event in the Upper Mainstem of the Russian River*** in March of 2011.

This report, drafted by Mr. Hines, ignores the noteworthy differences in the stranding substrate, and turns an undocumented percentage of 50 to 75 meters into 100 feet and 25% of 28 miles. The number of stranded fish is further amplified by multiplying these assumptions by a series of additional unsupported variables. The output of the dubious calculation exaggerates 10 fish in one spot on one day into 25,872 fish over numerous days and locations:

Table 1. Explicit assumptions used to derive estimates of the total number of salmonids killed in the upper Russian River mainstem during the 2008 frost season.

Event Dates	# of Events	Severity	Severity Index	Fish Density	Reach Length	% stranding habitat	Estimated # of Fish
3/23-4/16	10	Less	0.25	2.5/100ft	28 miles	0.25	9,240
4/20	1	Observed	1	10/100ft	28 miles	0.25	3,696
4/21	1	Most	1.5	15/100ft	28 miles	0.25	5,544
4/22	1	Equal to obs.	1	10/100ft	28 miles	0.25	3,696
4/24	1	Equal to obs.	1	10/100ft	28 miles	0.25	3,696
						Total Fish Kill:	25,872

When questioned by Mr. White on the data used to develop the assumptions, Mr. Hines states that there was no data to support the calculations:

Date: Tue, 31 May 2011 15:55:03 -0700
From: David Hines <David.Hines@noaa.gov>
Subject: Re: Hopland report

To: Sean White <rrfc@saber.net>

Sean,

The answer to each of your questions is basically the same: Since there were no data on those variables of interest, we used our best professional judgment to reasonably and conservatively define them. These were clearly stated as assumptions in the report.

David

On 5/18/2011 4:35 PM, Sean White wrote:

> David:
>
> I am interested in the supporting basis for some of the multipliers used to derive 25,872. Based on the information I received from my FOIA request, it appears that the only actual data for this calculation is Tom's single observation of 10 fish.
>
> If that is the case:
>
> How did you determine the relevant impacts of other (severity index) with out validation of the relationship?
>
> How did you determine that the fish density of 10 fish in 100 feet was representative of all 28 miles?
>
> How did you determine that the percentage of stranding habitat was 25% of the 100 feet? There was no ratio or percentage in Tom's note.
>
> How did you determine that this percentage was representative of all 28 miles?
>
> Sorry to be a pain in the neck but 10 to 25k is quite a leap, trying to get a feel for how you got there.
>
> Sean

In other words, "we have no evidence, so we guessed;" and a poor guess at that, based upon our review of the NMFS Document in **Exhibits H** and **I**.

In sum, the need for the regulation has been contrived by: (a) ignoring SCWA permit violations for political reasons, (b) undermining an effective collaborative approach, (c) failing to find any additional basis for the regulation, (d) refusing to turn over public documents to the public, and (e) creating a scientifically indefensible document that purports to show a basis for the regulation.

We recognize that special status fish were lost in April 2008. However, the actual physical evidence, scientific literature, and the 2009 BO strongly suggest the role that frost protection had, if any, in this event was smaller and more isolated than individuals from NMFS and SWRCB have alleged. Since 2008, efforts to remove frost protection from *any* role in either event have been completed through non-regulatory efforts driven by cooperation (see fourth reason immediately below). There is no evidence to support the contention that these two disparate events warrant broad, basin-wide regulation. There is evidence to support that when identified, problems can be resolved through cooperation, as shown by the results of the FPT. The fisheries and the public would be best served if this blind pursuit of a regulation was abandoned, and replaced by the "collaborative approach" originally advanced by the NMFS Southwest Division.

The fourth reason the regulation is not necessary is that significant improvements have been completed that remove frost protection from playing any role in future strandings. Consider the following:[54]

- The April 2008 stranding of ten fish on the Russian River near Hopland was allegedly related to a 0.39in/hr drop in flow (~ 83 cfs) at this location (see **Exhibit C**). Since this time:
    - Frost diversions have been coordinated with the Sonoma County Water Agency (SCWA) and the Russian River Flood Control District. This coordination will allow frost diversions to be considered when releases are made from Coyote Dam.
    - Several diverters who were pumping directly from the Russian River above Hopland in 2008 have built, or are in the process of building, reservoirs that will reduce the instantaneous demand on the Russian River by 91.6 cfs in all future years. We have attached as **Exhibit J** a table summarizing these construction projects and their expected reduction in demand. In addition to the capital costs outlined in the summary, many of these growers had to remove several acres of valuable wine grape vines in order to build the off-stream ponds. This information was originally provided to the SWRCB by the Russian River Frost Program's PowerPoint presentation at the November 18, 2009, SWRCB workshop, but has been supplemented with additional new information.
    - A new USGS gauge has been installed at Talmage, which allows for closer monitoring of Russian River flows during frost events that in turn allows for efficient releases from Coyote Dam thereby minimizing stage changes.
- The April 2008 stranding incident on Felta Creek was allegedly caused by one direct diverter frost protecting four acres of vineyard.
    - The pump used by the diverter has been removed from Felta Creek and

[54] This information has been summarized from the Russian River Frost Program Group's Power Point presentation made to the SWRCB on November 18, 2009. It is incorporated by reference.

replaced with a groundwater well that pumps water into an offstream reservoir.

These efforts have resolved any legitimate concerns SWRCB and NMFS may have had. As evidence, note that there have been no legitimate claims of frost-protection-related strandings on the mainstem of the Russian River below Coyote Dam or Felta Creek since 2008. In fact, attached as **Exhibit K** are declarations from several individuals who live along various tributaries that have never seen stream stage fluctuations due to frost protection activities, but have seen extreme fluctuations due to natural causes, some of which have resulted in naturally-caused strandings on those tributaries.

In addition to these corrective measures, it is important to recognize the 2008 frost event was extreme and rare. The occurrence of both low flows (<200 cfs at Hopland) and frost (<32 degrees) has only occurred in five of the last nineteen years, and for a total of sixteen days during these same five years. Both before and after 2008, there is no evidence to suggest frost-related strandings are occurring elsewhere in the Russian River watershed. However, growers are nevertheless working to manage their diversions and prevent any future conflicts with instream beneficial uses.

The fifth reason this regulation is not necessary is that Sonoma County already has an effective program in place. On February 15, 2011, the Sonoma County Board of Supervisors approved a frost protection ordinance that requires growers to disclose the number and type of water diversions used for frost protection, the acreage they frost protect with water, sources of water, rate of water application and water storage type. Anyone who uses water for frost protection must register with the County. A copy of the registration form is attached as **Exhibit L**. This registration will ensure 100% participation in the program. Once registered with the County, they become part of a monitoring program administered by a non-profit organization, the Russian River Water Conservation Council (RRWCC). The RRWCC is already administering the program for the County, and has already installed several gauges in streams identified by NMFS as “at risk” stream systems. All the information collected will be provided to a Science Advisory Group that will then provide recommendations to the RRWCC to address any frost protection and fishery conflicts. This program is up and running without the need for the incredibly blunt instrument the SWRCB is wielding.

The sixth reason this regulation is not necessary is that in its current form, it is simply unworkable. The methodology and the requirements imposed show that they were drafted by someone with little scientific understanding, and the data collected, if the methods required by the SWRCB are employed, will be worthless.

Some of these methods are described on pages 6 and 7 of the Statement of Reasons. These pages describe the method to be used when preparing the stream stage monitoring program. Generally, this method depends upon the placement of stream flow gauges in numerous locations where NMFS determines a potential for stranding could occur. This approach requires site specific transects at potential stranding locations and stream flow gauging. While the Statement of Reasons and the regulation discuss establishing a stream stage monitoring program, the site specific transect approach will require that the gauge be at the transect site. Otherwise the stream stage stations will need to be rated for discharge as are most stream flow gauging sites. This additional work will easily increase the costs of the gauging by 100%. Furthermore, it is highly unlikely that these locations will have the features required to produce reliable high quality stream flow datasets.

The required criteria for stream flow monitoring stations as specified by the US Geologic Survey include (see **Exhibit M**):

- The general course of the stream is straight for about 300 ft. upstream and downstream from the stream gauging site
- The total flow is confined to one channel at all stages, and no flow bypasses the site as subsurface flow
- The streambed is not subject to scour and deposition and is free of aquatic growth
- Banks are permanent, high enough to contain floods, and free of brush
- A pool is present upstream from the control at extremely low stages to ensure recording a stage at extremely low flow and to avoid high velocities near stream gauging station intakes during periods of high flow
- The stream gauging site is far enough upstream from the confluence with another stream to escape from any variable influence the other stream may have on the stage at the stream gauging location
- A satisfactory reach for measuring discharge at all stages is available within reasonable proximity of the stream gauging station (it is not necessary that the low and high flows be measured at the same stream cross-section)
- The site is readily accessible for ease in installation and operation of the stream gauging station

Most important of these criteria is to avoid placing gauges where there are significant losses of surface flow to groundwater, which occurs in all of the alluvial reaches of the tributaries and the river. The physical requirements for gauging sites apply whether a pressure transducer or stilling well is used. The description on page 82 of the EIR regarding how a gauging site is chosen is incorrect and inconsistent with all of these published protocols.

The EIR description of the stream flow gauging was not written by a person familiar with standard methods used in the hydrologic sciences or with the various types of equipment used. The single biggest factor in the accuracy of a gauge is the location chosen in the stream. There are numerous locations which will not produce a reliable dataset which meets QA/QC requirements. On page 83, the EIR states, "It is estimated that a total of 71 stream gages may need to be installed." It is not clear where these locations are and if they can be used as gauging sites. Without proper QA/QC measures, including proper location of gauges, the data acquired cannot be used for regulatory purposes.

This method also fails to recognize variations in stream flow processes between different types of channels and due to variations in rainfall, geology and land use in tributary watersheds. For example, on page 20 of the Draft EIR, a description of runoff processes is offered:

> *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...This relationship between rainfall and ground conditions results in streams with relatively "flashy" storm runoff hydrographs.*

This is the only description of runoff processes in the EIR and only applies to confined canyon channels of tributaries, not all tributary channels. It is also interesting that the flashy characteristics of the hydrograph are noted as these natural abrupt changes in stream stage are likely to strand or wash out juvenile salmonids.

A description of stream flow processes in the alluvial reaches of tributaries is omitted and differs substantially from the description in the EIR. In the large alluvial valleys of the watershed, runoff infiltrates until the groundwater table rises sufficiently to produce surface flow. Alluvial tributary reaches may experience changes of surface flow to subsurface and back numerous times over the rainy season. Additionally, the stage of the mainstem Russian River channel in the alluvial valleys (Ukiah, Alexander, Russian) largely defines the top of the groundwater table and affects stage in the alluvial reaches of the tributary streams.

The Draft EIR simply states:

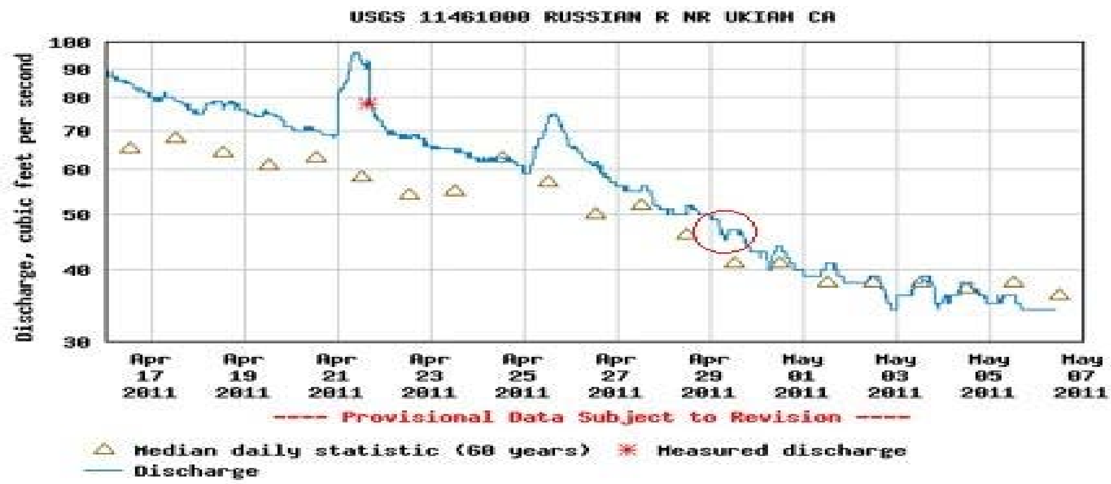
> In the valleys groundwater occurs in the alluvial deposits. The summer baseflow is maintained by groundwater discharge along reaches where the water table is higher than the adjacent stream. In the larger valley drainages, such as the Russian River, groundwater discharge is large enough to sustain perennial flow.

This description is erroneous and not based on any data or study of actual conditions. The Russian River, prior to the Potter Valley diversion and Coyote Dam, did not have perennial flow. Due to the well-documented channel entrenchment along the Russian River (page 38 EIR), the bottom elevation has dropped 18-20 ft creating a “French drain” effect to lower the groundwater table and dewater the tributaries. Each tributary undergoes losses of surface flow to groundwater (losing reach) and gains surface flow from groundwater (gaining reach) throughout the rainy season, depending on the timing and intensity of rainfall, geology of the tributary watershed, the operation of the Coyote and Warm Springs Dams and the stage of the Russian River. Large well fields and direct diversions also affect stream flow.

In these alluvial reaches, the method of defining transects and stream stage to avoid stranding does not include surface and groundwater interactions or river stage, all essential features affecting stream stage. It is very likely that even if all vineyard use of water for frost control could be stopped, stream flow could still be interrupted and fish stranded due to these pre-existing conditions. The regulation and EIR need to recognize that the Russian River system has geomorphic features and non-agricultural water uses which also affect stream flow and that changes to frost water uses will not ensure the idealistic flow regime described in the EIR.

We would be remiss if we did not address the “stranding” that occurred on April 29 of this year. Before we go any further, it is troubling to note that rather than conduct an investigation, NMFS chose to have the “stranding” published in the local newspaper (see **Exhibit N**). This is probably because you need actual evidence to conduct an investigation. Nevertheless, the “stranding” occurred on the west fork of the Russian River near Redwood Valley in Mendocino County. NMFS claimed in the news story that the stranding was the result of frost protection occurring in the valley. Specifically, SA Torquemada is quoted in the May 6th Santa Rosa Press Democrat as saying: “This incident illustrates that voluntary efforts have not prevented frost diversion-related fish kills and confirms the need to regulate water use....”

However, the facts of the situation show that the fish were stranded as the normal result of the streambed drying from the lack of rainfall. The USGS gauge directly below the "kill" shows no significant drop in flows or elevations from frost diversions. The graph does, however, document flows receding from 90 cfs to 50 cfs in the preceding week from cessation of rain and the onset of warm weather:



Note that the "drop" in flow is barely perceptible, and is nevertheless eclipsed by the consistent and rapid decline in river flow overall as a result of the lack of precipitation and the natural drying up of the stream bed.

In summation, this regulation is not necessary because:

- The real cause of the drop in streamflow was SCWA's failure to meet its water right permit terms. If SCWA had simply met its instream flow requirements, we would not be here today.
- There is no evidence supporting the need for the regulation.
- Any evidence purporting to justify the need for the regulation has either been fabricated or grossly exaggerated.
- Any contributing role that frost protection may have played in the stream stage drop in 2008 has been remedied.
- Sonoma County already has an effective frost registration program in place that will monitor the situation.
- The regulation, in its current form, is unworkable.

12. This Regulation is Overbroad

Assuming the SWRCB still insists on adopting this regulation, changes should be made to more narrowly target the ills it seeks to correct. The May 19, 2011, version of the regulation provides, in relevant part, as follows:

> (a) After March 14, 2012, any diversion of water from the Russian River stream system, including the pumping of hydraulically connected groundwater, for purposes of frost protection between March 15 and May 15 shall be unreasonable and a violation of Water Code section 100, unless the water is diverted pursuant to a board approved water demand management program…

On its face, it appears as though "any diversion of water" would include diversions to and withdrawals from storage, as long as the water was initially diverted from the Russian River stream system. We fail to see why those who have reservoirs capable of supplying an adequate supply of water should be subject to this regulation. Withdrawals from storage have no impact on stream flow or stage and should be exempt from this regulation. In order to clarify this in the regulation, a phrase exempting withdrawals from storage should be included in the regulation.

It is unclear why "hydraulically connected groundwater" is being included in the regulation. Aside from the legal problems associated with this position (discussed below), there is no evidence, empirical or otherwise, that diversions from wells were the cause of the two alleged fish strandings. Generally speaking, pumping groundwater naturally results in the creation of a cone of depression over time around a well that ultimately reaches equilibrium. The time required to reach such equilibrium depends upon pumping capacity and strata permeability. Therefore, the effects of pumping groundwater, even from wells situated closely to a surface water body, are significantly less than what would be encountered from a direct diversion.

Including groundwater within the reach of the regulation riddles implementation of the regulation with problems and is based on poor, or nonexistent, science. For example, the vast majority of groundwater wells are located in the large alluvial valleys along the Russian River and several of the larger tributary creeks. As described in a number of reports by the US Geological Survey and by the Ca. Dept. of Water Resources (see **Exhibit M**), the groundwater in these large alluvial deposits is recharged primarily by storm runoff from surrounding slopes and through alluvial fans and surface channels where water percolates into alluvial material. The quantity of water stored in this alluvial material can be enormous. **Exhibit O** summarizes this information. For example, the Alexander Valley southern groundwater basin has 200 ft. of alluvium and a storage capacity of 762,000 acre-feet. With a storage capacity of 762,000 acre-feet, there is little point in dragging wells in this basin into the regulation.

Of course, the regulation makes the statement that all of the groundwater in the drainage is "hydrologically connected" to streams. This term is not defined particularly in regard to the temporal nature of the connection between groundwater and stream flow. Percolating groundwater in these large aquifers may be stored for months to years before reaching a surface stream channel. The term is vague and no one will be able to prove that a well is not extracting hydraulically connected groundwater unless both a spatial definition and timeframe are added to the regulation.

Page 9 of the Statement of Reasons states that groundwater moves laterally from alluvial deposits to the stream channel deposits and then is discharged to the stream baseflow. This document further states that wells in the alluvium intercept groundwater that would otherwise discharge to the stream. This is a generalized and simplistic description of groundwater movement that is not accurate. Groundwater moves along hydraulic gradients formed by topographic variations and to a far lesser degree localized gradients formed by pumping. Therefore, it is incorrect to characterize all groundwater wells in alluvium as depleting streams of flow with no evidence that the groundwater basin levels are declining or measurements or studies showing groundwater depletion effects on stream flow. Studies completed by Dr. Matthew Deitch for the Russian River Property Owners Association demonstrated no change in stream flow in either the Russian River in the Alexander Valley or two local creeks during groundwater pumping for frost control (see **Exhibit P**).

The Stetson maps are identified as a source of information for determining stream depletion areas. These maps do not depict groundwater basins but instead show surface geology. They were created by tracing areas of geologic maps onto 1:24,000 quad sheets. Some of the sources the geologic maps used were 1:250,000 scale, leading to potentially enormous error. The maps simply show alluvial deposits and there is an assumption that wells in these areas affect stream flow. The technical reports which accompany these maps, "*Approach to Delineate Subterranean Streams and Determining Potential Stream flow Depletion Areas: Policy For Maintaining Instream Flows in Northern California Coastal Streams, February 28, 2008,*" states that stream depletion can be overestimated when:

- The stream does not fully penetrate the aquifer (it can lead to errors >100%);
- There is recharge other than from the stream;
- The water level in the aquifer falls below the bottom of the streambed.

All of these conditions occur in most of the Russian River alluvial groundwater basins. Additionally, this report states, "*Stream depletion resulting from pumping is not necessarily instantaneous*." The stated purpose of the regulation is to avoid instantaneous changes in stream stage. Therefore, it is clear that regulating all wells in alluvial deposits is unnecessary to avoid salmonid stranding.

Similar to groundwater, the SWRCB has not explained why it is necessary to include any portion of the mainstem of the Russian River below Coyote Dam in the regulation. The SWRCB has already exempted the Russian River above Coyote Dam, but there is no reason to keep the mainstem below the dam within the regulation when diversions have been removed and the existing flows are regulated by the Sonoma County Water Agency (SCWA), unless of course the SWRCB is not interested in enforcing permit terms. As discussed below, SCWA is legally obligated to maintain certain flows in the river during the critical frost protection period. The same holds true for Dry Creek below Warm Springs Dam. Both of these river/stream systems are highly regulated, which makes them legally obligated to meet the requirements of all lawful users of water and instream beneficial uses.

The only evidence the SWRCB does have justifies a greatly narrowed scope for the regulation. Page 57 of the draft EIR, and Table 4-5 of Appendix D of the draft EIR (Economic and Fiscal Impacts of the Proposed Russian River Frost Regulation), both refer to a NMFS GIS layer called "Potential Stranding Sites" that depicts the watercourses most likely to experience stranding events during frost protection activities. Although the SWRCB has this information available, it refuses to narrow the scope of the regulation to target just those areas NMFS has identified where potential strandings are likely to occur. The SWRCB provides no explanation why the regulation must span 1,778 miles of stream systems, or 1,485 square miles in two different counties, and conservatively cost an estimated $10 million dollars over three years, when NMFS has provided a document that narrows the scope of the regulation to just those areas that may need attention. It appears that the only thing the SWRCB has used the "Potential Stranding Sites" GIS layer for is to reduce the estimated economic impact of the regulation, which is inconsistent with the text of the regulation that requires the entire watershed to be regulated.

Because of these issues, the regulation should be rejected. If the SWRCB wanted to develop an appropriate regulation, it would have to address at least the following: (a) exclude withdrawals from storage, (b) exclude "hydraulically connected groundwater," (c) exclude the main stem Russian River below Coyote Dam, (d) exclude Dry Creek below Warm Springs Dam, and (e) limit the regulation only to areas where factual investigation has revealed an actual problem with frost diversions. By doing so, the SWRCB can significantly diminish the economic impacts and management burdens of this regulation without impairing its effectiveness.

13. The Regulation is Too Narrow

The draft regulation does not address other diversions from the Russian River stream system that impact stream stage, and therefore salmonid habitat, even though it is asserting its jurisdiction to prevent "take." This is an abuse of discretion because it fails to account for other elements of causation. Under the Endangered Species Act, any action that was a "substantial factor" in bringing about a take is subject to enforcement. For example, in *United States v. Glenn-Colusa Irrigation District* (E.D. Cal. 1992) 788 F.Supp. 1126, the court considered whether a fish screen or the pumping of water through that screen was responsible for a take when the pumping of water impinged endangered fish on the screen. Glenn-Colusa argued that the screen, which was owned and operated by the Department of Fish and Game, was responsible for the take because the screen was the direct cause of the killing of the fish. The court considered this argument "absurd for it is the pumping that creates the take,"[55] and that it "is irrelevant whether the taking is direct or indirect."[56] As long as something is a "substantial factor in bringing about the injury" causation will be found.[57]

And a "substantial factor in bringing about the injury" involves other water users on the system. These other diversions include domestic, municipal, and industrial users, as well as nighttime diversions that are unrelated to frost protection. Due to pricing tiers available from most electricity providers, there is a cost break associated with electricity use during "off-peak" hours—typically after 9:00pm in March and April. In order to take advantage of the price break, many large electricity customers wait until after 9:00pm to consume large amounts of electricity. Water diversions in the Russian River watershed are no different. We see no reason why diversions unrelated to frost protection must necessarily occur at night, when water demand is already quite high for frost protection purposes and water supply is limited. "When the supply is limited public interest requires that there be the greatest number of beneficial uses which the supply can yield."[58] Thus, water diversions unrelated to frost protection should be minimized at night in order to allow more frost protection. Water diversions unrelated to frost protection should occur during the day, which maximizes the number of uses of the limited supply.

Therefore, if the SWRCB truly desires to improve habitat conditions for fish in the Russian River, and not rest the entire problem at the doorstep of the agricultural community (which cannot compensate for the lack of flows caused by SCWA), then the regulation should be amended to include all diversions from the Russian River water system, including municipal and residential wells, and it should discourage nighttime diversions unrelated to frost protection.

14. The Proposed Regulation is Not Supported by the Findings or the Evidence

We incorporate in this section all of the arguments made in the other sections,[59] but we do wish to address several additional claims the SWRCB makes that are not supported by the findings or the evidence. The first is the SWRCB's declaration that <u>all</u> frost protection diversion within the Russian River watershed is "unreasonable." Such a broad declaration is unnecessary and

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[55] *Id* at 1133.
[56] *Id*. at footnote 13, citing *Palila v. Hawaii Dept. of Land & Natural Resources*, 639 F.2d 495 (9th Cir.1981).
[57] *Id*. at 1134.
[58] *Peabody v. City of Vallejo* (1935) 2 Cal.2d 351, 40 P.2d 486, at 368.
[59] Including, but not limited to, the issues with NMFS's GIS layer and the inclusion of groundwater in the regulation.

unsupported because it starts with a presumption of illegality with no justification. In light of the fact that only two fish strandings have been alleged, the first being caused by SCWA's failure to meet its instream flow requirements (if the stranding is even related to a drop in stage), and the other due to a single landowner allegedly dewatering a very small tributary, the SWRCB has not explained why these two isolated incidents justify the universal declaration that perhaps well over a thousand diversions of water from the Russian River stream system within 1,485 square miles are unreasonable.[60]

We would expect the SWRCB to only want to regulate those who could contribute to the perceived problem. As discussed above in the section "This Regulation is Overbroad," this can be accomplished by narrowing the geographic scope and types of water being regulated. If the SWRCB fails to narrow the scope of this regulation to just those who can be reasonably expected to contribute to the perceived problem, the SWRCB's decision is subject to review by the courts as an abuse of discretion.

An abuse of discretion is established if the decision is arbitrary, capricious, or entirely lacking in evidentiary support.[61] Among the elements of the proposed regulation lacking in evidentiary support is the inclusion of all the tributaries within the scope of the regulation and the inclusion of "hydraulically connected groundwater."

The SWRCB has no evidence justifying the inclusion of all the tributaries within the scope of the regulation. The SWRCB does refer to a study performed by Matthew J. Deitch, G. Mathias Kondolf, and Adina M. Merenlender that studied the effects of direct diversions on stream flows, but that study is much narrower in its focus than the SWRCB's regulation. While the study did examine streamflow in several tributaries, its results cannot be applied on a watershed level as the SWRCB is attempting to do with the regulation. One of the authors, Mr. Deitch, says as much when he learned of the SWRCB's reliance on his study as the basis for the regulation:

> It is important to recognize that these effects may not happen everywhere water is used for frost protection, and may not happen every time water is used for frost protection. As such, it is important that regulations do not apply a broad brush to prohibit use of water for frost protection. Rather, any actions should seek to maintain beneficial uses for agriculture as well as ensuring the preservation of streamflow…(See **Exhibit R**).

Thus, one of the authors of the very study the SWRCB is using to justify the scope of the regulation is cautioning the SWRCB that the study should not be applied to the entire watershed without site-specific analysis. The SWRCB has had this letter since April 6, 2011, yet it continues to rely on the study to support a proposition the study does not advance.

When applying the "arbitrary and capricious" standard to a decision of a public agency, the court will look to ensure the agency has adequately considered all relevant factors and has demonstrated a rational connection between those factors, the choices made, and the purposes behind the enabling statutes.[62] In this situation, the SWRCB is grossly overreaching its discretion

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[60] **Exhibit Q** shows the e-WRIMS search results for water rights in the Russian River Valley. While the search reveals 1,971 hits, some of these rights are revoked and not all allow frost protection. However, this search does not include Statements of Water Diversion and Use, of which there are an unknown number in the Russian River Valley.
[61] 1 Cal. Civil Writ Practice (Cont.Ed.Bar 4rd ed. 2009) §2.32, p. 27.
[62] *Carrancho v. California Air Resources Board* (2003) 111 Cal.App.4th 1255, 4 Cal.Rptr.3d 536

in that it is attempting to regulate conduct that has no “rational” or demonstrated connection to the isolated stranding events.

15. The SWRCB Has Not Proceeded in the Manner Required by Law

Similar to section 14, we incorporate all of the arguments from other sections into this section, but wish to address several additional actions the SWRCB has taken that are inconsistent with the law. The first is that the SWRCB has failed to provide frost water users in the Russian River watershed due process of law before it denies them a constitutionally protected property right. If the SWRCB wants to actually bring all the frost water users in the Russian River watershed under its authority, it must give proper notice and provide a hearing.

By its terms, the regulation is going to apply to all appropriative water rights, all groundwater rights, and all riparian water rights. These rights are real property. “Under California law, rights to use of underground waters, whether flowing, stored or percolating, by the overlying owner or appropriator are analogous and equal to riparian rights against subsequent claimants, and are part and parcel of the land, and as such are ‘real property.’”[63] “The right to water to be used for irrigation is a right in real property.”[64]

As property rights, they are subject to protection by the Due Process Clause of the State and Federal Constitutions (Cal. Const., art. I, § 7, U.S. Const., 5th Amend.). “We start with the basic proposition that in every case involving a deprivation of property within the purview of the due process clause, the Constitution requires some form of notice and a hearing.” The “hearing required by the Due Process Clause must be ‘meaningful,’ and ‘appropriate to the nature of the case.’” [65] At the very least, the hearing should provide opportunity to “present in a deliberate, regular, and orderly manner issues of fact and law.”[66] As elaborated by the U.S. Supreme Court, when discussing the type of hearing due process demands in an administrative context, the Court held that “identification of the specific dictates of due process generally requires consideration of three distinct factors:

- First, the private interest that will be affected by the official action;
- second, the risk of an erroneous deprivation of such interest through the procedures used, and the probable value, if any, of additional or substitute procedural safeguards; and
- finally, the Government’s interest, including the function involved and the fiscal and administrative burdens that the additional or substitute procedural requirement would entail.”[67]

With reference to the first factor, the property interest the SWRCB regulation will affect is real property that will adversely affect water users’ income, business opportunities and livelihoods. With reference to the second, the risk of an erroneous deprivation is manifest as the SWRCB has failed to address the legal flaws with its approach and appears to loaf along irrespective of the arguments raised in opposition of its action. And with reference to the final factor, the SWRCB has an interest and duty to prevent waste and unreasonable use of water, but that duty does not dispose of its obligation to exercise this authority with responsibility.

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[63] *Rank v. Krug*, S.D. Cal. 1950, 90 F.Supp. 773.
[64] *Schimmel v. Martin* (1923) 190 Cal. 429, 213 P. 33.
[65] *Beaudreau v. Superior Court* (1975) 14 Cal.3d 448, 458, 121 Cal.Rptr. 585.
[66] *H. Moffatt Co. v. Hecke* (1924) 68 Cal.App. 352, 28 P. 546.
[67] *Mathews v. Eldridge* (1976) 424 U.S. 319, 335 (bulleting added).

Part of this legal obligation is to notify every person within the Russian River watershed who owns a property right that could be affected by the regulation, and hold a proper hearing at which the parties may present evidence and question the SWRCB's scientific and legal justification for the regulation. Everything to date has been extremely informal and the parties that are aware have not been given any opportunity to dispute and question the credibility of the SWRCB evidence in an orderly, efficient, effective, and binding matter. The "hearing" the SWRCB proposes for September 20, 2011, is a "hearing" in name only. There is no provision for testimony or cross-examination—only the ability to comment for three minutes. By limiting the "hearing" to three-minute comments, the SWRCB is engaging in behavior that muzzles meaningful discussion of the issues, and allows it to rely on "evidence" that escapes public scrutiny, regardless of the reliability of that evidence, and ignore evidence it simply does not like. This behavior violates the constitutional rights of every water right holder in the Russian River watershed.

In addition to constitutional support, there is ample statutory support for the fact that the SWRCB must provide a formal notice and hearing to re-write the post-1914 water rights of frost water users in the Russian River watershed. For example, Water Code section 1394(b) requires the SWRCB to provide "notice to the parties and a hearing" if it desires to "amend, revise, supplement, or delete terms and conditions in a permit." Under Water Code section 1410(b)(2), the SWRCB can only revoke a permit after giving notice of the proposed revocation "in writing, mailed in a sealed, prepaid postage and certified letter to the permittee." Only if the permittee "fails to request a hearing" may the SWRCB revoke that permit without a hearing. Under Water Code section 1675(b), the SWRCB can only revoke a license after "due notice to the licensee and after a hearing."

Furthermore, if the SWRCB wants to actually investigate the use of water in the Russian River watershed and determine if there is an unreasonable use of water occurring, then a procedure is already in place in the California Code of Regulations. Division 5 of Title 23, Sections 4000 et seq. provide the procedure the SWRCB needs to follow when it wants to prevent the waste, unreasonable use, or diversion of water. Notably, section 4002(b) provides that only after a hearing is held may the SWRCB "issue its order requiring prevention or termination of the misuse."

If the SWRCB is required by statute and regulation to grant permit and license holders notice and a hearing before those permits or licenses can be modified or revoked, then the SWRCB is violating both statutory and constitutional law by not providing notice and a hearing when trying to adopt this regulation.

It is important to note that the SWRCB did at one time recognize the need to obtain jurisdiction over water right holders by providing notice and a hearing. It is significant that this recognition is part of the same basis that SWRCB cites for "regulatory precedent" in its *Draft* Initial Statement of Reasons. In its Statement of Reasons, the SWRCB relies on Section 735, Title 23, of the California Code of Regulations. Section 735 was originally section 659 and subsequently numbered section 735. The SWRCB adopted section 659 in 1974 to address frost protection activities in the Napa River watershed.

Section 659 as it was originally adopted provides:

> Because of high instantaneous demand for water of the Napa River in Napa County for frost protection and the inadequacy of the supply to satisfy the demand during the frost season after March 15 in most years, diversion of water from the Napa River after March 15 for frost protection except to replenish water stored in reservoirs prior to March 15 is an unreasonable method of diversion within the meaning of Article 14, Section 3 of the California Constitution and Section 100 of the Water Code. No permits for the appropriation of water from the Napa River after March 15 of any year for frost protection shall be granted except to replenish winter storage and such permits shall not be granted until a water distribution program among the water users is established that will assure protection to [sic] prior rights. Regardless of the source of water, the Board will retain jurisdiction to revise the terms and conditions of all permits issues for frost protection should future conditions warrant.

What makes section 659 different from the proposed Russian River regulation is that in order to enforce this regulation against riparian water users, the SWRCB initiated an action for injunctive and declaratory relief seeking to enjoin certain wine grape growers from drawing water directly from the Napa River and applying that water to their wine grapes for frost protection purposes. The case is *State Water Resources Control Board v. Forni* (1976) 54 Cal.App. 3d 743, 126 Cal.Rptr. 851. While losing at the trial court level, the SWRCB appealed and ultimately prevailed on the appeal. The opinion of the Court of Appeal is instructive on how the SWRCB obtained jurisdiction.

> Properly construed, section 659 amounts to nothing more than a policy statement which leaves the ultimate adjudication of reasonableness to the judiciary. Indeed, the initiation of the present action furnishes the best proof that the appellant did not consider the regulation and the policy declaration therein binding as to respondent riparian owners, and submitted the issue for judicial determination. (*Id*. at 752.)

Therefore, the SWRCB did recognize, at least in 1974, that it cannot by declaration deny water right holders due process of law without notice and a hearing. In order to obtain jurisdiction, the SWRCB filed an action in a court, which court then provided a hearing. Without this jurisdiction, section 659 was nothing more than a “policy statement” that was unenforceable against riparian owners. Thus, if the SWRCB wishes to impose the Russian River regulation against any water rights, it will need to commence a hearing.

A second example of the SWRCB not proceeding in the manner required by law, which is related to the right to a hearing discussed above, involves its delegation of authority to the Water Demand Management Program (WDMP). Under the proposed regulation, the SWRCB obligates the WDMP “[i]n developing the corrective action plan, the governing body shall consider the relative priorities of the diverters and any time delay between groundwater diversions and a reduction in stream stage.”[68] If a diverter is unable to comply with the corrective action plan, then that diverter shall “cease diverting water for frost protection.”[69]

We recognize the SWRCB is attempting to require the WDMP to enforce water right priorities in order to adhere to the holding in *El Dorado Irrigation District v. State Water Resources Control Board* (2006) 142 Cal.App.4th 937, 48 Cal.Rptr.3d 468, in which case the court considered

[68] Draft regulation, subsection (c)(4).
[69] Id.

whether the SWRCB could lawfully impose Term 91 on a water right permit with a 1927 priority, without imposing the same permit term on other water users that held water rights junior to the 1927 priority. The court held the SWRCB could not do this because it was essentially prohibiting El Dorado Irrigation District (EID) from diverting water when Term 91 was in effect (to maintain Delta water quality), but allowing other junior users to divert the same water. The court held:

> In summary, we agree with the trial court that the Board abused its discretion when it included term No. 91 in El Dorado's permit without including that term in the licenses and permits of junior appropriators, because imposition of term No. 91 in these circumstances subverted the rule of priority without adequate justification. (*Id* at 972, 496).

Of course, the SWRCB, in proposing to adopt this regulation, is attempting to enforce state law that all water use must be "reasonable." However, the *EID* court also addressed this question and succinctly stated that "when the rule of priority clashes with the rule against unreasonable use of water, the latter must prevail. Every effort, however, must be made to respect and enforce the rule of priority."[70] Thus, when there is inadequate water available to meet all of the beneficial uses, the rights of the junior "appropriator must yield to the rights of the riparian or overlying owner."[71]

The problem with requiring the WDMP to "enforce the rule of priority" when developing and imposing corrective actions is that the SWRCB is asking that the program essentially adjudicate the Russian River watershed. There is simply no other way to "consider" the relative priorities of all the different water users within the watershed and arrange them into a hierarchy under which the most junior of the water rights is forced to undertake the corrective action or cease diverting water.

"Considering" all the different rights to the system will be a monumental task. For example, assume the WDMP identifies a need for corrective action on a stream system. On that stream system are a total of eleven diverters: four claims of riparian rights, three claims of pre-1914 appropriative rights, two claims of post-1914 water rights, and two groundwater wells.

Of the three riparian right claims:

- one diverter's property is not contiguous to the stream
- one diverter irrigates several different legal parcels with water from the stream but only one of which is contiguous to that stream
- one diverter irrigates property that is contiguous to the stream, but this diverter also uses a portion of the water for domestic purposes

Of the two pre-1914 appropriative water right claims:

- one diverter has proof that his diversion structure was built prior to 1914, but cannot provide proof of continuous beneficial use
- one diverter has no proof of when his diversion structure was built, but does have sworn statements from prior owners that allege it was built in 1913

Of the two post-1914 appropriative water rights:

- One has a storage reservoir above several of the other diverters. This diverter

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[70] *Id* at 966, 490.
[71] *City of Barstow v. Mojave Water Agency* (2000) 23 Cal.4th 1224, 99 Cal.Rptr.2d 294.

releases water from that reservoir which flows past these diverters for use on his vineyard. This diverter claims that no natural surface water exists in the system after March and that all the downstream diverters divert his foreign water
- One uses water from the system for domestic purposes. This right has a priority of 1975.

Of the two groundwater wells:
- One well is within 50 feet of the stream.
- One well is within 500 feet of the stream.

Of this mix of water rights, how is the WDMP going to decide who gets to divert and who doesn't? Who has to undertake expensive corrective measures, while others get to continue to divert? Does the SWRCB expect the diverter who is asked to pay for expensive corrective measures to simply accept it when that diverter believes his rights are superior to others on the system? The WDMP is not equipped to deal with the judicial nature of a determination of rights. The only mechanism to resolve this dispute is an adjudication.

Adjudications can be handled one of two ways. First is an adjudication under Chapter 1, of Part 3 of the Water Code (Water Code §§ 2000 et seq.). Under Chapter 1, any person may bring a suit in any court of competent jurisdiction for a determination of rights to water. Second is an adjudication under Chapter 3 of Part 3 of the Water Code (Water Code §§ 2500 et seq.). Under Chapter 3, upon any petition signed by one or more claimants to water of any stream system, the SWRCB may enter an order granting the petition and commence making the determination.

Regardless of the mechanism used, both mechanisms constitute authority to conduct a judicial or quasi-judicial determination of rights under the law. The SWRCB cannot simply delegate its judicial authority to determine the relative priority of rights of a stream system to a water demand management program.

"An administrative board cannot legally confer…authority that under the law may be exercised only by the board."[72] While "merely administrative and ministerial functions may be delegated…there is no authority to delegate acts discretionary or quasi-judicial in nature."[73] Yet the delegation of "acts discretionary or quasi-judicial in nature" is precisely what the SWRCB is doing by requiring the WDMP to consider water right priorities when developing corrective actions. The WDMP is not equipped to deal with the complex legal determinations necessary to resolve my hypothetical (but likely to be similar to very real situations) scenario outlined above. By passing this obligation on to the WDMP, the SWRCB is hoping to punt the difficult questions, and the liability, onto a group that is ill-equipped and legally inappropriate to handle the situation. This, the SWRCB cannot do.

A third example of the SWRCB not proceeding in the manner required by law involves its denial of our request for an extension to comment on the most recent form of the regulation and its supporting documentation. While an administrative agency may have wide discretion in granting or denying continuances, that discretion is not unlimited. Among the factors a judge will consider in examining an administrative agency's denial for an extension include whether there have been continuances in the past, whether the request was made prior to or on the day of the

[72] *Schecter v. County of Los Angeles* (1968) 65 Cal.Rptr 739, 742.
[73] *Id*.

hearing, and any factual showing of prejudice that resulted from the denial of the continuance.[74]

In our situation, the SWRCB posted a draft EIR, a new regulation, an Initial Statement of Reasons, and a Notice of Proposed Rulemaking on May 20, 2011. Each one of these documents included numerous studies, references, facts, and figures that we had never seen before and some were not even readable by any known program (SWRCB Water33.sde). The deadline to submit comments was set for noon on July 5, 2011, which meets the minimum legal standard of 45 days. On June 1, 2011, we requested a 45-day extension of time to comment on this material. On June 6, 2001, the SWRCB denied our request, stating that "prior drafts of the regulation, initial statement of reasons, and portions of the Notice of the Proposed Rulemaking had been previously released on March 23, 2011. With a comment period ending on July 5, 2011, this provides a total 105-day review period for a significant portion of the information…" This statement is utterly ridiculous. The differences between the "prior drafts" and the current drafts are substantial. And in addition, there was significant new additional material. This statement of bad faith is amplified by the SWRCB choosing July 5 as the deadline. The day after a national holiday during which every business, including the SWRCB, will be closed, and just a few days after the deadline for all appropriative water right users (and many Statement holders) to report their annual water use to the SWRCB. The date appears to be intentionally chosen to reduce the public's ability to provide comprehensive comments to the SWRCB's regulation. The irony of this action is not lost on us, as such an action sounds like the behavior of the King of England before we declared our independence from Great Britain.

The final example of the SWRCB not proceeding in the manner required by law is that because there is no evidence justifying the regulation, it is not a legitimate exercise of the police power, and therefore amounts to a denial of due process of law.[75] Similarly, this regulation will effectively take people's vested property rights by denying use of water during one of the most important times of the season, and therefore most valuable times of the season, available under that right, which is a taking of private property without just compensation, regardless of whether it is considered a categorical or regulatory taking.[76]

In summary, the SWRCB has not proceeded in the manner required by law because it has: (a) denied vested property right holders due process of law by failing to provide adequate notice and hold a hearing; (b) improperly delegated its authority to resolve disputes between different water right priorities; (c) failed to grant an extension to the public comment period; and (d) failed to meet its burden to exercise police power, which has resulted in a denial of due process and/or a taking of private property without just compensation.

16. Underestimates the Costs That Will Be Associated with Implementation of the Regulation

The regulation as currently proposed will impose staggering costs upon grape growers, which will have consequential indirect financial impacts within the entire State of California, especially within Mendocino and Sonoma counties. These costs are not adequately disclosed in any of the

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[74] Cal. Administrative Mandamus (Cont.Ed.Bar 3rd ed. 2011) §6.92, pp.229-230.
[75] *Lingle v. Chevron U.S.A.* (2005) 544 U.S. 528.
[76] *Brown v. Legal Foundation of Wash*. (2003) 538 U.S. 216, *Palazzolo v. Rhode Island* (2001) 533 U.S. 606, *Lucas v. South Carolina Coastal Council* (1992) 505 U.S. 1003, *Tulare Lake Basin Water Storage District v. United States* (2001) 49 Fed.Cl. 313, *Penn Central Transportation Co. v. New York City* (1978) 438 U.S. 104, *Armstrong v. United States* (1960) 364 U.S. 40.

SWRCB documents. Briefly, the SWRCB documents underestimate the costs of some elements of the regulation, ignore the costs of other elements, or include estimates based on unjustified assumptions. Each of these problems are outlined below.

Attached as **Exhibit S** is an economic study prepared by Prof. Robert Eyler of Sonoma State University. This study shows that even if the regulation were to result in a minimal 10% crop loss, it could cost the California economy more than $2 billion annually, including $143 million in lost tax revenue to local governments and Sacramento, $113 million in decreased land values and more than 8,000 jobs in Sonoma and Mendocino counties. These losses are realistic yet *very conservative* because it is important to recognize several facts about this regulation.

First, the SWRCB regulation will operate as a complete prohibition on water use for frost protection until a water demand management program is developed, approved, and implemented. These steps will take several months to complete, perhaps even years. Therefore, in the meantime, vineyard owners will be unable to use water to protect their crops and would be expected to suffer extreme wine grape losses until alternative forms of frost protection could be acquired.

Second, assuming the regulation is implemented within a reasonable time, not every vineyard owner will be able to comply with its terms for either financial or practical reasons. For example, according to the SWRCB's own analysis, this regulation is expected to cost a typical 160-acre vineyard from $9,600 to $352,000 in order to initially comply with its mandates. It will cost an additional $3,000 to $36,200 per year to keep that 160-acre vineyard in compliance. It is expected to cost a typical 40-acre vineyard from $2,400 to $87,880 in order to initially comply with its mandates. It will cost an additional $750 to $9,000 per year to keep that 40-acre vineyard in compliance (see **Exhibit A**). Many small family farms will not be able to absorb this cost, so they will be forced to shift to another crop if they can afford to or sell the land (see **Exhibit B**). These costs associated with grape production loss are completely ignored in the SWRCB documents, as they are not discussed anywhere. The SWRCB documents simply assume everyone will be able to afford the above costs, which is shocking.

Third, there may be cases where water can no longer be used for frost protection. In these cases, the farmer must find an alternative form of frost protection (e.g. wind, heaters, etc.). If no alternative form of frost protection is feasible, either because it is too expensive or because alternative forms are not effective (e.g. in Mendocino County where frost events are particularly extreme and where no inversion layer typically exists), then that farmer could lose his entire crop.

Based just on these three facts, the proposed regulation will have significant economic consequences for California. While the SWRCB is required under Government Code section 11346.5 to identify and describe these costs, the costs the SWRCB *has disclosed* as part of the Notice of Proposed Rulemaking significantly underestimate those costs.

STD Form 399 and the attached Economic and Fiscal Impacts of the Proposed Russian River Frost Regulation ("Form 399") is attached as Appendix D to the SWRCB draft EIR. We assume Form 399 is meant to fulfill the SWRCB's obligation to identify and describe costs of the regulation as it very helpfully categorizes and then quantifies anticipated costs of the regulation. We had Form 399 reviewed by Prof. Robert Eyler, whose review revealed that Form 399 has underestimated the financial cost of the regulation in several key areas. First, the capital costs of implementing "corrective actions" under the regulation are likely underestimated. Second, Form 399 uses outdated multipliers that underestimate the economic impact on industry and employment, and does in fact underestimate employment losses by between 15% and 56%. Third, the methodology used to determine a "typical" business is flawed and likely underestimates the number and scope of businesses to be affected by the regulation. A copy of Prof. Eyler's report is attached as **Exhibit T**.

In addition to Prof. Eyler's concerns, we have several related issues with Form 399. Similar to the regulation, Form 399 outlines the elements of the Water Demand Management Program and then attempts to predict a cost associated with each element. For ease in reference, I will set out each element of the WDMP in the same way that Form 399 does.

<u>Section 4.1 - Frost Diversion System Inventory</u>

Under the Frost Diversion System Inventory, Form 399 uses the $64 Sonoma County Frost Protection Ordinance registration fee as the basis for determining the cost to develop the inventory. However, the inventory also requires each and every individual diverter to monitor and record their rate of diversion, hours of operation, and volume of water diverted during each frost event of the year. Form 399 does not consider these costs at all.

It is true that the recent changes to the Water Code require individual diverters to monitor and record water diverted and used on a <u>monthly</u> basis, but the requirements of the proposed regulation go above and beyond demanding monthly totals. The proposed regulation wants each individual frost event monitored and recorded, not a monthly total. This additional layer of measurement will result in substantial additional costs that have not been considered in the analysis.

In order to monitor each and every frost protection diversion and meet the requirements of the regulation, additional meters must be installed at each diversion location. Based upon quotations we received for this same work (**Exhibit U**), we estimate the cost to be approximately $8,800 per diversion. Based upon a survey conducted by the Sonoma County Farm Bureau, there are 418 diversions in the Russian River watershed in Sonoma County. We currently have no information on the number of diversions in Mendocino County. However, due to the similar number of acres frost protected by water in Mendocino County (16,400) and Sonoma County (15,581) it is reasonable to assume there are a similar number of diversions in Mendocino County.[77] Based upon 836 diversions, we have a total cost of $7,356,800.00.

<u>Section 4.2 - Stream Stage Monitoring Program</u>

Under the Stream Stage Monitoring Program, Form 399 does list and disclose the possible costs associated with the installation and operation of 71 stream stage monitoring gauges. However, there are two problems with these costs. One, the costs are from Washington State, which has different permitting requirements, and two, the costs are ten years old.[78] We believe a more accurate estimate is found in our **Exhibit V**. Each telemetry capable meter is estimated to cost between $14,000 and $16,000 per diversion, and with the estimated permitting costs of $3,000 per diversion, this element of the monitoring and reporting program will cost an additional

[77] See footnote 13.

[78] See Table 4-3, footnote 1, Economic Impacts of the Proposed Russian River Frost Regulation, May 2, 2011, Appendix D to the SWRCB draft EIR.

$1,278,000 (71 gauges using $18,000 as an average) to implement. In addition, it will cost an additional $8,000 to $12,000 to maintain each diversion on a regular basis. This adds a yearly cost of $710,000 (71 gauges using $10,000 as an average) to the monitoring and reporting program.

In addition to underestimating the gauge costs, Form 399 does not include costs associated with determining "the stream stage that should be maintained at each gage to prevent stranding mortality." We contacted an environmental consulting firm that can provide this service (Analytical Environmental Services or "AES") and asked them for a bid. Based upon their review of the proposed regulation requirement, they anticipate a total cost of approximately $52,560.00 per site. Using Form 399's estimate of 71 gauges (see Table 4-2 of Form 399), we expect the costs to be $3,731,760.00 (see Tasks 1-7 of **Exhibit W**).

Section 4.3 - Risk Assessment

Based on the inventory and stream stage information collected from the monitoring program, the risk assessment is supposed to evaluate the potential for frost diversions to cause stranding mortality. The risk assessment shall be evaluated and updated annually. The annual preparation of the risk assessment "was estimated by Water Board staff at $50,000." Similar to the above section we had AES provide a bid for this work, and the SWRCB was only off by a factor of 10. At a price of $7,120.00 per site, multiplied by 71 sites, we have a total price of $505,520.00 to prepare the SWRCB's annual risk assessment (see Task 8 of **Exhibit W**).

Section 4.4 - Corrective Actions

a. Areas that may require corrective actions.

In Section 4.4 of Form 399, the SWRCB estimates the number of acres that would need corrective action (Table 4-5), and then estimates number and collective capacity of existing storage facilities. In order to determine the number of acres that would need corrective action, Form 399 utilizes the NMFS GIS layer of "Potential Stranding Sites." This GIS layer represents NMFS estimations of the most "at risk" locations for stranding. The problem with this approach is that it grossly underestimates the number of acres that will be affected by this regulation. The regulation will apply to the entire Russian River watershed, not just the NMFS "Potential Stranding Sites," so it is unjustified to reduce the costs in this way. All this does is unjustifiably underestimate the costs of the regulation.

b. Existing Water Storage Facilities

After determining the number of acres needing "corrective action," existing reservoir capacity and additional cost are subsequently estimated as part of an effort to determine the amount of additional storage capacity needed to satisfy frost protection demand in excess of existing capacity.[79] Conceptually, this approach is overly general as it does not consider factors that would limit a grower's access to an existing pond. The biggest potential factor is the fact that the grower may not own the pond and would need to obtain access agreements with other landowners. While Section 4.4 does apply a reduction factor to the estimated existing capacity available in each county (0.85 for

[79] Note that Table 4-6, which summarizes estimated existing reservoir capacity on a watershed basis within each county, is not referenced anywhere in the text of Appendix D.

Mendocino County and 0.75 for Sonoma County), the basis for this adjustment is unclear. Section 4.4 states that the capacity adjustment was based on "approximations of known wastewater treatment ponds and residential density in specific areas of the watershed" while Footnote 2 to Table 4-6 states "Not all water storage facilities are available for frost protection due to other ownership and other dedicated uses." No other supporting information is disclosed to support the assumed reduction factors, which means that the amount of existing capacity available is likely overestimated and the extent of additional capacity required is underestimated.

Further, the reduction factors assume an either/or condition, i.e. a grower will either have access to an existing pond or he won't. In instances where such access is possible, the cost of acquiring access to another landowner's pond has not been considered in Form 399.

Section 4.4 has other issues that require modification and/or further disclosure:

1. Table 4-5 summarizes "measured crop acreages and areas protected by existing frost control methods" in Mendocino County and Sonoma County, respectively, on a watershed basis. However, while reference documents are cited, a map showing the boundaries of "measured crop acreages" within each watershed is not included in any of the EIR documents. These maps should be included so that the information in Form 399 can be understood and corroborated.

2. For Sonoma County, Table 4-5 wrongly extrapolates County-wide information provided in Table 3-7 to individual watersheds. There is no basis to assume that the "Method of Frost Protection" percentages provided in Table 3-7 for Sonoma County as a whole are applicable to the individual watersheds listed in Table 4-5. The use of this extrapolation provides an unverified and likely misleading summary of the distribution of existing methods of frost protection in Sonoma County. The SWRCB should provide information to support the use of the Table 3-7 percentages on a watershed basis in Table 4-5, or delete the watershed breakdown values in Table 4-5.

c. Constructing additional off-stream water storage

One significant factor overlooked in Section 4.4 (page 20) is the assumption that additional off-stream water storage facilities can even be built in light of the SWRCB's new North Coast Instream Flow Policy (NCIFP). Based upon analysis provided by Rudolph Light, the new policy effectively eliminates ponds built within watersheds equal to or less than 1 square mile in size. For ponds between 1 and 15 square miles, a person would only be able to divert for a few days each year, which would eliminate all but the smallest of ponds (see **Exhibit X**). Section 4.4 does not consider this new policy and instead assumes that all one has to do is file an application and a permit for a new pond will be provided. Under the new instream flow policy, new ponds in the Russian River watershed will be extremely difficult to build and practically no new ponds will be built that will be of sufficient size to last through a frost season.

Section 4.4 of Form 399 states that after allowing for a 50 percent USDA-NRCS AWEP cost share, the unit cost for construction of a pond of less than 50 acre-feet would be

$2,625 for an unlined pond and $3,622 for a lined pond. The costs to build new reservoirs are significantly underestimated.

Table 4-8 indicates the cost of a 30 acre-foot off-stream pond to be $157,500, which equates to unit cost of about $5,250 per acre-foot of storage. A second line item in Table 4-8 adds $20,000 for an assumed 1,000-foot length of transmission pipeline. The "Total Capital Costs/pond" for pond and pipeline is $177,500. Based on this "total" cost, the unit cost per acre-foot of reservoir storage would be about $5,900 per acre-foot. Table 4-8 assumes that half of the capital cost will be covered by a NRCS AWEP cost share, and therefore the "cost to grower" would only be $88,750. This amount is subsequently added to various costs associated with regulatory permitting to arrive at a "Total grower costs/pond" of $202,409. This value is a substantial portion of the basis used to derive annual costs to growers later in Table 4-8.

The methodology presented in Table 4-8 has a number of shortcomings that result in underestimating the true cost of constructing and operating off-stream storage ponds for frost protection, as follows:

1. The estimate does not appear to include any costs associated with engineering design or geotechnical investigation. The estimate also does not appear to include engineering inspection and testing services during construction. Collectively, professional services associated with design, construction and contract management can be a substantial percentage of the construction cost, perhaps 15 to 30 percent depending upon level of project complexity and other factors. If these costs have not been included in the estimated construction cost in Table 4-8, they should be added and the capital and annual costs recomputed.

2. Notwithstanding any changes to the estimated cost that might result from item 1 above, the use of a unit construction cost of $5,250 is unrealistically low, especially if a pond liner is required. Examples:

   <u>Fetzer Sundial Pond</u> – A lined pond constructed in 2009, storage capacity = 32.9 acre-feet. Per Dave Koball of Fetzer, total capital cost was about $386,000, which equates to a unit cost of about $11,700 per acre-foot. This is more than double what Table 4-8 assumes.[80]

   <u>Fetzer Los Cerros Pond</u> – An unlined pond constructed in 2009, storage capacity = 19.4 acre-feet. Per Dave Koball of Fetzer, total capital cost was about $149,000, which equates to a unit cost of about $7,700 per acre-foot. While this is closer to the value used in Table 4-8, Mr. Koball indicated that the pond leaks significantly and that a bid of $60,000 has been received for a liner. Assuming that the actual cost of the liner is the same as the bid, total capital cost will rise to about $209,000 and the unit cost will rise to about $10,800 per acre-foot.[81]

   <u>La Ribera (Al White)</u> – Mr. White reported that the cost of his 50 acre-foot pond project was about $500,000 (this cost included plumbing modifications for filling

[80] Emails to P. Whealen and Nick Bonsignore of Wagner & Bonsignore, June 16, 2011.
[81] Ibid.

and withdrawing water from the pond).[82] The unit cost is therefore about $10,000 per acre-foot of storage which greatly exceeds the aforementioned amount of $5,900/acre-foot derived from Table 4-8's "Total Capital Costs/pond" estimate.

Beckstoffer – Rich Schaefers of Beckstoffer reported that the cost of this 68 acre-foot lined pond in 2009 was about $389,000.[83] The unit cost is therefore about $5,700 per acre-foot. While this value is close to the unit cost stated in Section 4.4, it should be noted that this is for a pond having a capacity that is greater than 50 acre-feet. While each pond project has its own unique conditions, the unit cost of a reservoir project generally decreases as the pond capacity increases. As discussed in item 3 below, the cost of a new pump station for this pond greatly increased the unit cost per acre-foot for the project as a whole.

3. Table 4-8 allows a cost of $20,000 for a pipeline, presumably for the purpose of conveying water from the source stream to the reservoir. However, Table 4-8 omits the cost of a new pumping station at the reservoir that would be needed to pump water out of the reservoir for frost protection. Additional costs will potentially be incurred for reconfiguring mainline piping systems for the new pump station. For example, for the Fetzer projects identified in item 2 above, about $168,000 was expended at the Sundial Pond for new pumps and appurtenant facilities, and about $69,000 was expended at the Los Cerros Pond for new pumps, mainline piping and appurtenant facilities.

   For the Beckstoffer project identified in item 2 above, the cost for pumps was about $220,000. When this cost is added to the pond construction cost the total is cost is $609,000, resulting in a unit cost for the project of about $8,960 per acre-foot.

   Table 4-8 should be revised to include the cost of new pumping facilities that will be needed at new ponds for the withdrawal and application of water for frost protection. Table 4-8 also excludes the cost of fencing around these ponds; a fence is typically used around plastic-lined ponds for safety and to exclude wildlife that can damage the pond liner.

4. The assumption of a 50 percent NRCS AWEP cost share is not a "given," however, Table 4-8 assumes that it will apply. There are several conditions to qualify for the limited AWEP funds (see **Exhibit Y**):
   - Growers must meet certain economic qualifications to qualify for these funds. Of the projects mentioned in item 2 above, the Fetzer and Beckstoffer projects did not qualify.
   - Based upon our conversation with Carol Mandel of the NRCS, the AWEP cost share program has, at most, two years left.
   - The money available is not unlimited. The program is competitive and the NRCS office ranks the projects based on estimated water savings. Only some projects are funded each year.
   - Due to price increases, the program only offers a fixed amount of money, not a 50% cost share as discussed in Table 4.8. This fixed rate translates into only a 30% to 40% cost share. Even at this level, many applicants cannot afford to

[82] Email to Paula Whealen, June 15, 2011.
[83] Personal communication with Nick Bonsignore, June 21, 2011.

construct the pond. In fact, several applicants who were awarded funding last year still could not afford to build the pond.

- In order for an applicant to be considered for funding, they must have a permit from the SWRCB or some other legal basis authorizing the storage of water. Based on the SWRCB's own Water Code section 1259.2 report, it takes the SWRCB anywhere from 2-5 years to issue a permit on a water right application in Sonoma or Mendocino counties (which we think is still *extremely* optimistic)(see **Exhibit Z**). Thus, by the time anyone undertakes corrective action under this regulation and applies for a permit to store water, the NRCS AWEP funding program will be over. This means that Table 4.8 in Form 399 should be rewritten and it should not consider any cost share from NRCS.

In sum, the costs to build a reservoir are grossly underestimated in Form 399. Table 4.8 does not include engineering and design costs, costs for a new pumping station, and inappropriately assumes a 50% cost share from NRCS.

d. Installing Wind Machines

While Form 399 (page 22) does accurately report the costs one could expect to pay to install wind machines, it incorrectly assumes fans will work in Mendocino County and it excludes heater costs. All of the costs associated with installing wind machines in Mendocino County should include the cost of heaters, otherwise, the cost is significantly underestimated.

It is important to note that Mendocino County experiences more frost events, on average, than Sonoma County, and the frost events it does experience are generally much colder. See attached **Exhibit AA,** which is a GIS-based frost risk assessment for the Russian River Valley. This analysis was prepared by a student, but was presented by NOAA Fisheries during a SWRCB frost protection workshop held on July 14, 2009. Note the much greater number of frost events at and above Hopland each year. Because of the more frequent and colder temperatures, it has been stated with conviction that fans simply do not work in Mendocino County without a significant number of heaters. Furthermore, some heater costs should be included in the Sonoma estimates because as Form 399 does state, fans do not work in all situations.

e. Drilling Water Wells

Form 399 does not include the costs associated with determining whether a well is hydraulically connected to the Russian River. Because this cost should be included in any analysis, we obtained an estimate from Todd Engineers, an engineering firm that specializes in hydrogeology. The estimate to determine whether a well is hydraulically connected to the Russian River is $15,000.00. Please see **Exhibit BB**.

f. Coordinated Water Diversions

Form 399 says cost of coordinating diversions would be negligible, but no basis for that estimation is provided. Extensive planning and communication would be required to coordinate diversions in real time across the Russian River watershed.

g. Adoption of Best Management Practices

The BMPs are a-f above and therefore we incorporate our above comments by reference.

Section 4.5 - Annual Report
Staff estimates the cost to develop the annual report at $20,000 annually, but provides no information supporting the estimate. This section should be revised to disclose how this value was determined.

Section 4.6 - Direct Cost of the Proposed Regulation (related to Section 5.4 Benefits of Regulation)
This section asserts the economic equivalence of costs and benefits associated with the proposed regulation, but information is lacking to support this conclusion.

Item C.3 of Form 399 asks for a dollar figure response on the "total statewide benefits from this regulation over its lifetime." The response to Item C.3 refers to Section 5.3, however Section 5.3 does not address economic benefits. Item D.2 of Form 399 asks for dollar figures for the benefits associated with the proposed regulation and alternatives. The response to Item D.2 refers to Section 5.4 of Form 399, which *subjectively* and *qualitatively* describes the benefits of the proposed regulation, but does not *quantify* the economic benefits of the regulation. In addition to benefiting salmonids, Section 5.4 speculates that the proposed regulation "could lead to an increase in recreational and commercial fishing" which would benefit "people who work in the commercial fishing industry and the rural communities that provide goods and services to recreational anglers," however, no dollar values are assigned to these benefits in Section 5.4 or elsewhere in the document. Section 5.4 concludes by stating that there is "intrinsic value" to preserving salmonid species.

In Section 4.6 it is stated that the direct cost of the proposed regulation to Mendocino and Sonoma County growers "represents a reduction in income to growers but an increase in economic activity to firms providing services and products for frost protection therefore there is no net loss in aggregate welfare. The cost to growers of meeting the requirements of the proposed regulation is roughly equal to the regional economic benefits realized by those expenditures." While the cost of the regulation will be borne locally, there is no information provided to conclude that the "firms providing services and products for frost protection" are local, therefore it cannot be concluded from the information provided that there is no net loss to the aggregate welfare, at least in the local context.

Furthermore, any increase in economic activity due to the purchase of services and products will be temporary, and the on-going costs to the growers will continue long after the temporary bump in economic activity. The loss in tax revenue to the counties will also be permanent (see pages 49-51 of **Exhibit S)**. Therefore, one cannot reasonably conclude there is "no net loss in aggregate welfare."

In sum, Form 399 significantly underestimates costs by:

- assuming that everyone subject to the regulation will be able to afford corrective measures, when in fact many will suffer significant crop loss every frost season,
- using outdated multipliers in its analysis,

- underestimating employment losses,
- failing to include the costs of meter systems the regulation will require,
- using outdated and nonlocal estimates for meters it does include in the cost analysis,
- failing to include the costs associated with determining the stream stage necessary to prevent stranding,
- failing to include the costs associated with performing an annual risk assessment,
- unjustifiably reducing the number of acres that will be affected by the regulation,
- assuming most reservoirs are eligible to be used for frost protection,
- assuming additional reservoirs can even be built in light of the SWRCB North Coast Instream Flow Policy,
- underestimating reservoir construction costs,
- failing to include pump station costs as part of reservoir construction costs,
- assuming that USDA-NRCS grants are unlimited, apply to everyone and provide a 50% cost share,
- assuming wind machines can be used effectively in Mendocino County, and
- failing to include the costs associated with determining whether a groundwater well is "hydraulically connected" to the Russian River stream system.

Finally, there is nothing in Form 399 that quantifies benefits economically, and therefore the assertions of no net loss in aggregate welfare and the equality of expenditures and benefits are not supported in this document.

17. Is Unable to Meet the Findings That Will Be Necessary for the Regulation to Survive Legal Challenge

Government Code section 11350 provides:

> (a) Any interested person may obtain a judicial declaration as to the validity of any regulation…by bringing an action for declaratory relief in the superior court in accordance with the Code of Civil Procedure….The regulation…may be declared invalid for a substantial failure to comply with this chapter….

Government Code section 11346.5(a) provides:

> (7) If a state agency, in proposing to adopt, amend, or repeal any administrative regulation, makes an initial determination that the action may have a significant, statewide adverse economic impact directly affecting business, including the ability of California businesses to compete with the businesses in other states, it shall include the following information in the notice of proposed action:
>
> > (A) Identification of the types of businesses that would be affected.
> > (B) A description of the projected reporting, recordkeeping, and other compliance requirements that would result from the proposed action.
> > (C) The following statement: "The [SWRCB] has made an initial determination that the [adoption] of this regulation may have a significant, statewide adverse economic impact directly affecting business, including the ability of California businesses to compete with businesses in other states. The [SWRCB] (has/has not) considered proposed alternatives that would lessen any adverse economic impact on business and invites you to submit proposals. Submissions may include the following considerations:
> >
> > > (i) The establishment of differing compliance or reporting requirements or timetables that take into account the resources available to businesses.
> > > (ii) Consolidation or simplification of compliance and reporting requirements for

businesses.
(iii) The use of performance standards rather than prescriptive standards.
(iv) Exemption or partial exemption from the regulatory requirements for businesses.

***

(9) A description of all cost impacts, known to the agency at the time the notice of proposed action is submitted to the office, that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

***

(13) A statement that the adopting agency must determine that no reasonable alternative considered by the agency or that has otherwise been identified and brought to the attention of the agency would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

Put differently, in order to survive a legal challenge, this regulation, among other things, must: (a) disclose the fact that this regulation will have a significant, statewide adverse economic impact directly affecting business, (b) disclose that this impact will impair California businesses' ability to compete with businesses in other states, (c) disclose all the businesses that will be affected by the regulation (e.g. wineries, growers, management companies, labor, hotels, restaurants, etc.), (d) disclose all of the monitoring and reporting the SWRCB will be imposing on the grape growers, and (e) disclose all the costs that a private person or business would incur in complying with this regulation.

The SWRCB appears to have disclosed (a) and (b), but not (c), (d), or (e). Based upon what has been written above, the SWRCB needs to go back and disclose the real impact on businesses, disclose more of the monitoring obligations and costs, and disclose more accurate estimates of the costs individuals and businesses can expect to pay under this regulation.

Even though it has made some disclosures, the SWRCB must still consider alternatives (see (13) directly above) that reduce or exempt the monitoring and reporting impacts on businesses and private persons. As has been outlined on the previous pages, there are many alternatives that can reduce these costs:

1. The most prudent approach in light of all the evidence would be for the SWRCB to back away from the regulation and allow the counties and the local growers to manage the watershed. With the Endangered Species Act looming in the background, there is no incentive for a frost water user to create or maintain a conflict with a special status species. The Federal ESA enforcement proceeding on Felta Creek is incentive enough to work together and avoid any conflicts. As discussed above, Sonoma County already has a program in place and if the SWRCB would let it proceed, a similar program could be developed in Mendocino County if necessary. Neither county is interested in this regulation and the impacts it will create.
2. If the regulation must stay, there would be significant cost savings by exempting growers on:
    a. Dry Creek below Warm Springs Dam because it is highly regulated due to releases from Lake Sonoma and there has been no evidence to suggest diversions on this creek impair salmonid habitat.
    b. The mainstem below Coyote Dam because it too is highly regulated from releases from Lake Mendocino and there has been no evidence to suggest diversions below the dam currently impair salmonid habitat.
3. There would be similar cost savings by exempting those who pump from wells—

underflow or percolating. Groundwater pumping attenuates any possible direct impact on river flows or stage by supplying the water from the underground aquifer.

4. If the SWRCB is concerned that diverting directly from the main stem or Dry Creek may still create a drop in river stage, it could exempt growers on the main stem Russian River and Dry Creek who *also* pump from wells. This adds an extra layer of protection.

In addition to the changes already mentioned in the "This Regulation is Overbroad" section, there are some additional changes that can be made to limit the effects of this regulation without impairing its effectiveness.

5. Extend the deadline date to March 14, 2013. Based upon **Exhibit V**, obtaining the necessary permits to install the stream gauges takes a minimum of one year.
6. Enroll all water diverters, including domestic and municipal, into the program.

Conclusion

We recognize the importance of this matter; however, the SWRCB has not provided an adequate legal basis for the regulation; it has not adequately disclosed, examined, or mitigated the environmental impacts that will result from the regulation; and it has not proceeded procedurally or substantively in conformance with the law. A principle reason the SWRCB has been unable to meet these burdens is because the proposed regulation is simply not necessary. The problems identified in 2008 have been addressed and significant steps have been undertaken to ensure adequate protection of instream beneficial uses. Yet this regulation runs the risk of encompassing and eliminating a wide variety of activities that will not help salmonids, which will impose substantial unnecessary costs, while at the same time ignoring actions that could assist salmonids. We recommend that the SWRCB consider, in full, the comments and suggestions made in this letter and let us know if you have any questions.

What is most distressing about the proposed regulation is the lack of good science, facts, and analysis of economic impacts surrounding it. It is important to the State of California that the SWRCB get the science, economics, and the scale right before it imposes such an enormous and unnecessary burden on the lives and livelihoods of so many citizens.

Very truly yours,

Jesse W. Barton

Exhibit A

DRAFT NOTICE OF PROPOSED RULEMAKING

TITLE 23. WATERS
DIVISION 3. STATE RESOURCES CONTROL BOARD AND REGIONAL WATER QUALITY CONTROL BOARDS
CHAPTER 2. APPROPRIATION OF WATER
ARTICLE 22. PREVENTION OF WASTE AND UNREASONABLE USE

NOTICE IS HEREBY GIVEN that the State Water Resources Control Board (State Water Board or Board) proposes to adopt the proposed regulation described below after considering all comments, objections, and recommendations regarding this proposed action.

PROPOSED REGULATORY ACTION

The State Water Board proposes to add Section 862 in Chapter 2, Division 3, Title 23 of the California Code of Regulations (CCR). This section concerns water diversion practices for frost protection of crops in the Russian River watershed in Mendocino and Sonoma counties.

PUBLIC HEARING AND WRITTEN COMMENT PERIOD

The State Water Board will hold a public hearing on the proposed regulation at a Board Meeting starting at 9 a.m. on **September 20, 2011** in the Coastal Hearing Room on the second floor at 1001 "I" Street, Sacramento, CA. A map to the Joe Serna Jr./Cal-EPA Building and parking information are available at http://www.calepa.ca.gov/EPABldg/location.htm. The Joe Serna Jr./Cal-EPA Building is accessible to people with disabilities. Individuals who require special accommodations at the Joe Serna Jr./Cal-EPA Building are requested to contact Catherine Foreman, Office of Employee Assistance, at (916) 341-5881. Due to enhanced security precautions at the Cal-EPA Headquarters Building, all visitors are required to register with security staff prior to attending any meeting. Depending on the size and number of meetings scheduled on any given day, the security check-in could take up to fifteen minutes. Please allow adequate time to sign in before being directed to the hearing.

Oral comments will be allowed and limited to 3 minutes or as otherwise allowed by the Board Chairman. Any person wishing to make a comment at the hearing will be asked to complete a speaker card available in the hearing room. Any written statements, arguments, or contentions related to the proposed regulation must be received by 12:00 noon on July 5, 2011. Any interested person, or his or her authorized representative, may submit written comments relevant to the proposed regulatory action. Written comments must be received by the State Water Board before the written comment period closes in order to be considered by the State Water Board before it considers adoption of the proposed regulation.

EXHIBIT A

Comment letters may be submitted by email to commentletters@waterboards.ca.gov (if less than 15 megabytes in total size) or by fax at (916) 341-5620. Please indicate in the subject line: "Comment Letter – Proposed Russian River Frost Regulation." Written comments may also be delivered by mail to:

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812-0100

or hand-delivered to the following address:

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

Couriers delivering comment letters must check in with lobby security personnel on the first floor of the Cal-EPA Building at the above address. Questions on comment submittal may be directed to Ms. Townsend, at (916) 341-5600.

To be added to the mailing list for this rulemaking and upcoming hearing, and to receive notification of updates to this rulemaking, you may subscribe to the Lyris list for public notices regarding Russian River Frost Protection on the State Water Board's website at: http://www.waterboards.ca.gov/resources/email_subscriptions/swrcb_subscribe.shtml. Enter your name and e-mail address and check the box next to "Russian River Frost Protection" under "Water Rights Topics." You will receive a confirmation e-mail. You must respond to the confirmation e-mail or your name will be deleted from the mailing list. For assistance subscribing to the Lyris list you may also call Karen Niiya at (916) 341-5365. **Individuals who receive this notice from the State Water Board by mail or e-mail are already on the mailing list.**

AUTHORITY AND REFERENCE

Section 1058 of the Water Code authorizes the State Water Board to adopt the proposed regulation, which would implement, interpret, or make specific the following State statutes: Water Code Sections 100, 275 and 1051.5 and Section 2, Article X of the California Constitution.

INFORMATIVE DIGEST/POLICY STATEMENT OVERVIEW

Water Code section 1058 allows the State Water Board to make such reasonable rules and regulations as it may from time to time deem advisable in carrying out its powers and duties. The purpose of the proposed regulation is to prevent salmonid mortality in the Russian River watershed due to the cumulative effect of instantaneous diversions for purposes of frost protection of crops in Sonoma and Mendocino Counties. During a frost event, the high instantaneous demand for water for frost protection by numerous vineyardists and other water users may cause a rapid decrease in stream stage that results in the mortality of salmonids due to stranding.

The proposed regulation would provide that water diversions from the Russian River stream system, including hydraulically connected groundwater, for purposes of frost protection from March 15 through May 15 violate the prohibition against the unreasonable diversion or use of water, unless water is diverted in accordance with a Board approved water demand management program, or water is diverted upstream of Warm Springs Dam in Sonoma County or Coyote Dam in Mendocino County.

In addition to its permitting authority, the State Water Board has a duty to protect, where feasible, the State's public trust resources, including fisheries. The State Water Board also 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. (*Peabody v. Vallejo* (1935) 2 Cal.2d 351, 366-367.)

In this case, application of the reasonable use doctrine requires consideration of the benefits of diverting water for purposes of frost protection, the potential for stranding mortality to occur, and the diverters' ability to frost protect without causing stranding mortality by coordinating or otherwise managing their diversions to reduce instantaneous demand. If properly managed, high flows during wet winters may provide enough water to meet human needs and prevent stranding mortality. A number of other management tools also exist that can be used to reduce the instantaneous demand for water during frost events. Given the potential impact to salmonids 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.

The proposed regulation would require any water demand management program to be approved by the Board in order to ensure that the program will effectively reduce the instantaneous demand on the Russian River stream system during frost events to prevent stranding mortality. The regulation would require the water demand management program to be administered by an individual or governing body capable of ensuring that the goals of the program will be met. In addition, the program would be required to include the following: (1) an inventory of the frost diversion systems within the area subject to the program, (2) a stream stage monitoring program, (3) an assessment of the potential risk of stranding mortality due to frost diversions, (4) development and implementation of a corrective action plan if necessary to prevent stranding mortality, and (5) annual reporting of program data, activities, and results.

FISCAL IMPACT ESTIMATES

Mandate on Local Agencies or School Districts: The proposed regulation requires that any water demand management program be administered by an individual or governing body capable of ensuring that the requirements of the program are met. The proposed regulation does not impose a mandate on local agencies because the regulation does not require the governing body to be a local governmental agency. The program could be developed and administered by an individual, non-governmental organization, or other private entity. However, local government agencies may choose to administer the water demand management program on a voluntary basis.

If a local government agency chooses to oversee the water demand management program, the estimated costs for administering the program is $452,007, which includes the costs for developing and maintaining a frost diversion system inventory, installing and maintaining stream stage gages, conducting a risk assessment and updating it annually, and preparing an annual report.

Additionally, a local agency that provides water to its customers for frost protection purposes may be subject to the proposed regulation. Accordingly, such an agency could incur the costs of participating in a water demand management program. The cost to an agency of participating in a water demand management program will largely depend on the acreage served. The cost can range from $60 per acre to $2,197 per acre and is dependant on whether or not corrective actions will need to be taken. However, the local agency's customers who divert water from the Russian River for purposes of frost protection are likely to bear these costs directly, in which case there would be no cost to the local agency. Even if costs are incurred by a local agency, they would not be subject to state reimbursement pursuant to Government Code section 17500 et seq., for two reasons. First, any costs incurred as a result of the regulation do not fit the definition of state mandated costs because they would not be incurred as a result of a regulation implementing a statute enacted after 1975. (See Gov. Code, § 17514.) Second, the regulation does not require local agencies to undertake a new program or provide a higher level of service in an existing program. Rather, the regulation would apply equally to all frost diversions, irrespective of whether the diverter is a local agency, an individual, or a private entity, and therefore the costs of compliance are not unique to local government. (*See County of Los Angeles v. State of California* (1987) 43 Cal.3d 46, 57-58.)

Cost or Savings to any State Agency: There are two State agencies that will incur a fiscal cost as a result of this regulation, the California Department of Fish and Game (DFG) and the State Water Board.

- **Total estimated cost to DFG - $130,000** - The proposed regulation requires that participants consult with DFG while developing and implementing their water demand management program. Consultation would be required for developing a stream stage monitoring program and conducting a risk assessment of potential stranding mortality due to diversion operations. It is estimated that DFG will need one PY in order to carry out consultations with participants. The total estimated cost to DFG is $130,000.

- **Total estimated cost to State Water Board - $260,000** – Adoption of the regulation will create an additional work load for staff at the State Water Board's Division of Water Rights (Division). Staff at the Division will need to review and approve all water demand management programs that are developed by participants. Additionally, staff will need to review annual reports and approve any proposed changes to the program. Staff will also be needed to review and approve requests for exemptions from the regulation for participants claiming to be pumping groundwater that is not hydraulically connected to the Russian River stream system. It is estimated that the Division will need to dedicate two PY's to accomplish this additional workload. The total estimated cost to the Division is $260,000.

Other Non-discretionary Cost or Savings Imposed on Local Agencies: With the possible exception of the costs to local agencies described above, the State Water Board has determined that no non-discretionary cost or savings would be imposed on local agencies.

Cost or Savings in Federal Funding to the State: The State Water Board has determined that there is no cost or savings in Federal funding to the State.

ECONOMIC IMPACT ESTIMATES

Statement of Significant Statewide Adverse Economic Impact Directly Affecting Business: Businesses, primarily vineyardists, that divert water for frost protection use in the Russian River watershed will be affected by the proposed regulation.

It is projected that affected businesses will need to monitor and maintain records regarding the rate of diversion, hours of operation, and volume of water diverted during each frost event. Businesses would report the data to the individual or governing body that is administering the water demand management program. The individual or governing body would install and monitor stream gage information and prepare annual reports. Business would be required to implement corrective actions if data indicates potential risk of salmonid stranding mortality exists.

*

The State Water Board has made the initial determination that the adoption of this regulation may have a significant, statewide adverse economic impact directly affecting business, including the ability of California businesses to compete with businesses in other states. The State Water Board has considered proposed alternatives that would lessen any adverse economic impact on business and invites you to submit proposals. Submissions may include the following considerations:

(1) The establishment of differing compliance or reporting requirements or timetables that take into account the resources available to businesses.
(2) Consolidation or simplification of compliance and reporting requirements for businesses.
(3) The use of performance standards rather than prescriptive standards.
(4) Exemption or partial exemption from the regulatory requirements for businesses.

*

Cost Impacts on Representative Persons or Businesses: The State Water Board estimates that the initial capital costs for a160-acre vineyard to comply with the proposed regulation would range from $9,600 to $17,000 and the annual costs would range from $3,000 to $4,700. Capital costs for implementing any needed corrective actions for a 160-acre vineyard would range from $236,000 to $352,000, with annual costs ranging from $26,000 to $36,200.

Effect on Creation or Elimination of Jobs within California: The State Water Board has determined that the proposed action will initially reduce region-wide employment by 4 jobs and by 18 jobs within five years. The State Water Board estimates the proposed action will increase employment by an equal amount of jobs because it anticipated there will be an increased need for products and services for frost protection.

Effect on Creation of New Businesses or Elimination of Existing Businesses: The State Water Board has determined that the total direct cost of the proposed regulation represents a reduction in income to vineyardists but an increase in economic activity to firms providing services and products for frost protection therefore there is no net loss in aggregate welfare. Additionally, the regulation requires 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 and therefore the State Water Board assumes that it is highly unlikely that a business would be eliminated as a result of complying with the regulation.

Effect on the Expansion of Businesses Currently Doing Business within California: The State Water Board has determined that the proposed action will cause an increase in economic activity to firms providing services and products for frost protection, such as consulting services, sales of wind machines or orchard heaters, and construction of offstream reservoirs. The estimated increased economic activity associated with these services and products is estimated to be $6 million.

Effect on Small Businesses: The State Water Board estimates that the initial capital costs for a 40-acre vineyard to comply with the proposed regulation would range from $2,400 to $4,000 and the annual costs would range from $750 to $1,140. Capital costs for implementing any needed corrective actions for a 40-acre vineyard would range from $59,000 to $87,880, with annual costs ranging from $6,500 to $9,000.

Business Report: The proposed regulation requires annual reporting of water demand management program data, activities and results. In the absence of the proposed regulation, businesses could continue to divert water for frost protection use in a manner that causes stranding mortality of salmonids, a public trust resource that is in danger of extinction. Accordingly, it is necessary for the health, safety, and welfare of the people of the state that the proposed regulation apply to businesses.

CONSIDERATION OF ALTERNATIVES

In accordance with Government Code Section 11346.5, subdivision (a)(13), the State Board must determine that no reasonable alternative it considered or that has otherwise been identified and brought to its attention would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

The State Board invites interested persons to present statements or arguments with respect to alternatives to the proposed regulation at the upcoming hearing or during the written comment period.

AVAILABILITY OF INITIAL STATEMENT OF REASONS, DRAFT ENVIRONMENTAL IMPACT REPORT, AND TEXT OF PROPOSED REGULATION

The State Water Board has prepared an Initial Statement of Reasons for the proposed action. The Initial Statement of Reasons includes the specific purpose of the regulation proposed for adoption and the rationale for the State Water Board's conclusion that the regulation is reasonably necessary to carry out the purpose for which the regulation is proposed. The State Water Board has also prepared a Draft Environmental Impact Report that contains an analysis of the potential environmental impacts of the proposed action. The Initial Statement of Reasons, Draft Environmental Impact Report, the express terms of the proposed regulation and all information on which the proposal is based are available from the agency contact person named in this notice.

The rulemaking file is available for inspection and copying throughout the rulemaking process at the State Water Board's Division of Water Rights Records Unit, 1001 I Street, 2nd floor, Sacramento, California. Key documents from the rulemaking file will also be published and made available on the State Water Board's internet website. This website address is: http://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/russian_river_frost/

AVAILABILITY OF CHANGED OR MODIFIED TEXT

Following the public hearing, the State Water Board may adopt the proposed regulation as originally proposed, or with nonsubstantial or grammatical modifications. If the State Water Board makes modifications that are sufficiently related to the originally proposed text, it will make the modified text (with the changes clearly indicated) available to the public for at least fifteen (15) days before the State Water Board adopts the regulation as modified. A copy of any modified regulation may be obtained by contacting Karen Niiya, the primary contact person identified below. The State Water Board will accept written comments on the modifications to the regulation for fifteen (15) days after the date on which they are made available.

AVAILABILITY OF FINAL STATEMENT OF REASONS

Upon its completion, a copy of the Final Statement of Reasons may be obtained by contacting either of the persons listed below. A copy may also be accessed on the website mentioned above.

ADDITIONAL INFORMATION

Inquiries concerning the substance of the proposed action may be directed to:

Karen Niiya
Division of Water Rights
P.O. Box 2000
Sacramento, CA 95812-2000
Telephone: (916) 341-5365
E-mail address: kyniiya@waterboards.ca.gov

or

John O'Hagan
Division of Water Rights
P.O. Box 2000
Sacramento, CA 95812-2000
Telephone: (916) 341-5368
E-mail address: johagan@waterboards.ca.gov

Exhibit AA

Spring Frost Risk in the Russian River Watershed

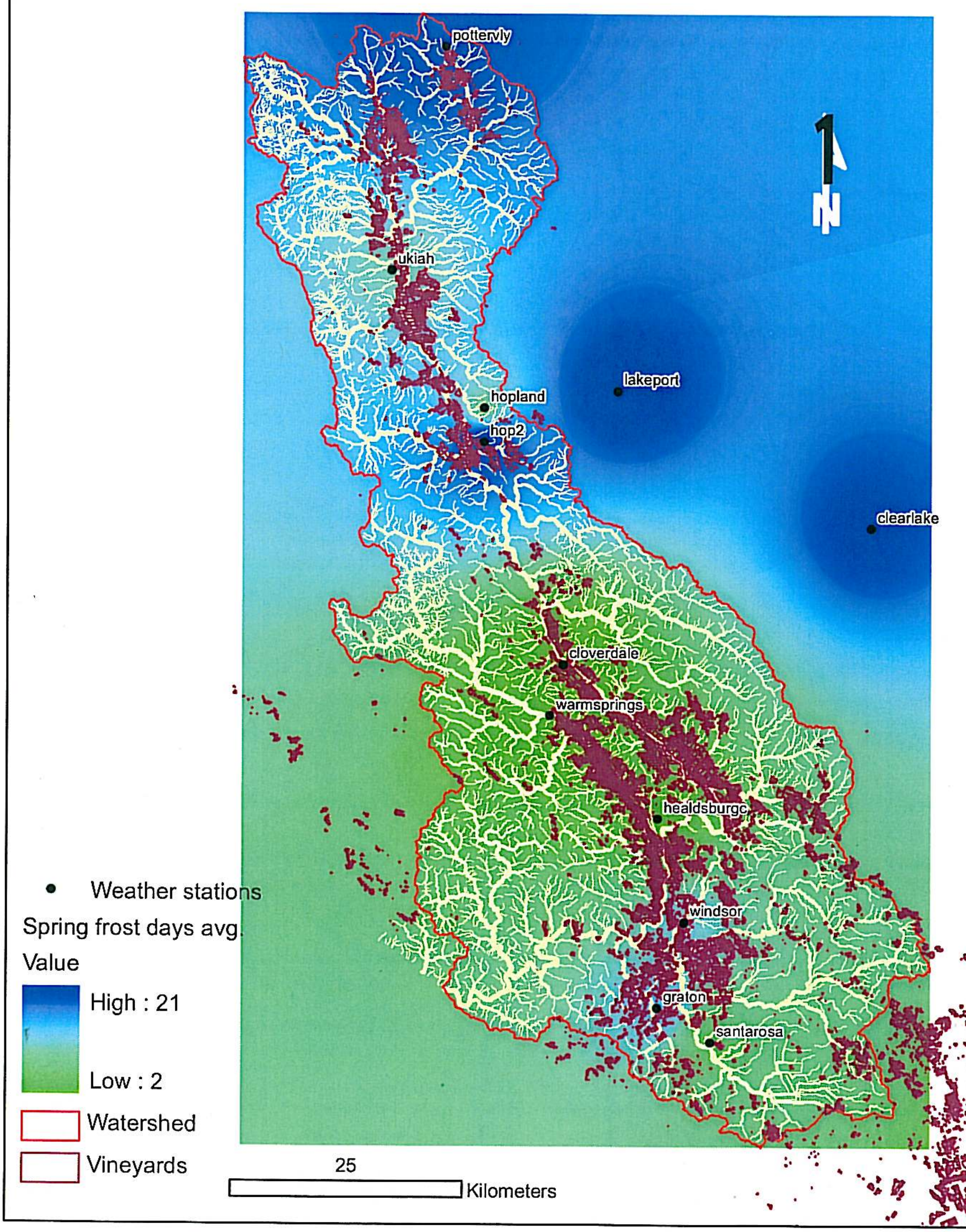


EXHIBIT AA

Exhibit B

Affidavit on
Frost Protection Use

My full name is Margo Warnecke Merck

1. The information contained in this affidavit is based upon my personal knowledge.
2. In the last 38 years three generations of family have used water diverted from the Russian River, or a tributary of the Russian River, for frost protection purposes.
3. I plan on using water for frost protection purposes in the future.
4. All of our income is derived from income I receive from selling crops that depend upon using water for frost protection.
5. I have read and am familiar with the State Water Resources Control Board's Draft Notice of Proposed Rulemaking. In this draft document the SWRCB estimates the costs that a 160-acre vineyard owner and a 40-acre vineyard owner could expect to incur to comply with the proposed Russian River Frost protection regulation.
6. If I were forced to incur these costs outlined in the SWRCB document in order to continue to use water for frost control I would likely have to cease using water for frost control purposes.
7. As a result of not having water available for frost control, I would either: (a) increase crop insurance at added cost and assume the added risk of crop loss or (b) invest in a wind machine at significant and unbearable cost.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 21, 2011

Signature: Margo Warnecke Merck
Margo Warnecke Merck, President
Warnecke Ranch & Vineyards

EXHIBIT B

Affidavit on
Frost Protection Use

1. My full name is Joseph Judge- Judge Family Vineyard

2. The information contained in this affidavit is based upon my personal knowledge.

3. In the last 11 years I have used water diverted from the Russian River, or a tributary of the Russian River, for frost protection purposes. (My vineyard well is 750 feet deep)

4. I plan on using water for frost protection purposes in the future. (for my 10 acre vineyard).

5. 50% portion of my income is derived from income I receive from selling crops that depend upon using water for frost protection.

6. I have read and am familiar with the State Water Resources Control Board's Draft Notice of Proposed Rulemaking. In this draft document the SWRCB estimates the costs that a 160-acre vineyard owner and a 40-acre vineyard owner could expect to incur to comply with the proposed Russian River Frost protection regulation.

7. If I were forced to incur these costs outlined in the SWRCB document in order to continue to use water for frost control, I would likely have to cease using water for frost control purposes.

8. As a result of not having water available for frost control I would either: have to purchase wind machines or not farm the frost prone areas. The cost of wind machines would place a significant financial burden on my family. I will not be able to get crop insurance because we sell our grapes by the acre (not by the ton) and the insurance programs to not allow coverage for farmers who sell grapes by the acre.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 30, 2011

Signature: Joseph Judge

Affidavit on
Frost Protection Use

1. My full name is Michael L. Hildreth________________________.
   (Print name)

2. The information contained in this affidavit is based upon my personal knowledge.

3. In the last five years I have used water diverted from the Russian River, or a tributary of the Russian River, for frost protection purposes.

4. I plan on using water for protection purposes in the future.

5. A significant portion of my income is derived from income I receive from selling crops that depend upon using water for frost protection.

6. I am aware that the SWRCB estimates this regulation is expected to cost a typical 160-acre vineyard from $9,600 to $352,000 in order to initially comply with its mandates. It will cost an estimated additional $3,000 to $36,200 per year to keep that 160-acre vineyard in compliance. It is estimated to cost a typical 40-acre vineyard from $2,400 to $87,880 in order to initially comply with its mandates. It will cost an additional $750 to $9,000 per year to keep that 40-acre vineyard in compliance.

7. If I were forced to incur these costs in order to continue to use water for frost control, I would likely have to cease using water for frost control purposes.

8. As a result of not having water available for frost control, I would be forced to sell land as I could not pay expenses, the realestate and development bank loans and property taxes.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: __June 20, 2011
(Month and day)

Signature: Michael L. Hildreth

Affidavit on
Frost Protection Use

1. My full name is JOHN D. SUACCI.

2. The information contained in this affidavit is based upon my personal knowledge.

3. In the last 10 years I have used water diverted from the Russian River, or a tributary of the Russian River, for frost protection purposes.

4. I plan on using water for frost protection purposes in the future.

5. A significant portion of my income is derived from income I receive from selling crops that depend upon using water for frost protection.

6. I have read and am familiar with the State Water Resources Control Board's Draft Notice of Proposed Rulemaking. In this draft document the SWRCB estimates the costs that a 160-acre vineyard owner and a 40-acre vineyard owner could expect to incur to comply with the proposed Russian River Frost protection regulation.

7. If I were forced to incur these costs outlined in the SWRCB document in order to continue to use water for frost control, I would likely have to cease using water for frost control purposes.

8. As a result of not having water available for frost control, I would either: (a) would cease farming altogether as program cost and crop losses would be too high to recover cost and remain profitable or (b) would need to reduce the amount of acreage farmed and either leave the remainder fallow or sell it.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 20, 2011

Signature: John D. Suacci

Affidavit on
Frost Protection Use

1. My full name is Kenneth Richard Todd.

2. The information contained in this affidavit is based upon my personal knowledge.

3. In the last five years I have used water diverted from the Russian River, or a tributary of the Russian River, for frost protection purposes.

4. I plan on using water for from protection purposes in the future.

5. A significant portion of my income is derived from income I receive from selling crops that depend upon using water for frost protection.

6. I am aware that the SWRCB estimates this regulation is expected to cost a typical 160-acre vineyard from $9,600 to $352,000 in order to initially comply with its mandates. It will cost an estimated additional $3,000 to $36,200 per year to keep that 160-acre vineyard in compliance. It is estimated to cost a typical 40-acre vineyard from $2,400 to $87,880 in order to initially comply with its mandates. It will cost an additional $750 to $9,000 per year to keep that 40-acre vineyard in compliance.

7. If I were forced to incur these costs in order to continue to use water for frost control, I would likely have to cease using water for frost control purposes.

8. As a result of not having water available for frost control, I would either: (a) likely cease farming altogether because my crop losses would be so high that it would be difficult to cover my costs in bringing what little fruit I could harvest to market; or (b) reduce the amount of acreage I do farm and either leave the remainder fallow or sell it.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 20, 2011

Signature: ____________

Affidavit on
Frost Protection Use

1. My full name is Leonard J. Brutocao, Jr. VP/Sec Brutocao Vineyards, Inc.

2. The information contained in this affidavit is based upon my personal knowledge.

3. In the last five years I have used water diverted from the Russian River, or a tributary of the Russian River, for frost protection purposes.

4. I plan on using water for frost protection purposes in the future.

5. A significant portion of my income is derived from income I receive from selling crops that depend upon using water for frost protection.

6. I am aware that the SWRCB estimates this regulation is expected to cost a typical 160-acre vineyard from $9,600 to $352,000 in order to initially comply with its mandates. It will cost an estimated additional $3,000 to $36,200 per year to keep that 160-acre vineyard in compliance. It is estimated to cost a typical 40-acre vineyard from $2,400 to $87,880 in order to initially comply with its mandates. It will cost an additional $750 to $9,000 per year to keep that 40-acre vineyard in compliance.

7. If I were forced to incur these costs in order to continue to use water for frost control, I would likely have to cease using water for frost control purposes.

8. As a result of not having water available for frost control, I would either: (a) likely cease farming altogether because my crop losses would be so high that it would be difficult to cover my costs in bringing what little fruit I could harvest to market; or (b) reduce the amount of acreage I do farm and leave the remainder fallow. In the latter scenario, a significant number of our vineyard employees would need to be laid off. Both scenarios would also have a detrimental affect on our winery business since most of our wines are estate grown. We would significantly reduce the amount of wine we could produce and sell therefore causing even more job losses.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 21, 2011

Leonard J. Brutocao, Jr.
VP/Sec Director of Vineyard Operations

Signature:

916 444-6915

Affidavit on
Frost Protection Use

1. My full name is ____Devin Willis Gordon______________________________.
   (Print name)

2. The information contained in this affidavit is based upon my personal knowledge.

3. In the last five years I have used water diverted from the Russian River, or a tributary of the Russian River, for frost protection purposes.

4. I plan on using water for from protection purposes in the future.

5. A significant portion of my income is derived from income I receive from selling crops that depend upon using water for frost protection.

6. I am aware that the SWRCB estimates this regulation is expected to cost a typical 160-acre vineyard from $9,600 to $352,000 in order to initially comply with its mandates. It will cost an estimated additional $3,000 to $36,200 per year to keep that 160-acre vineyard in compliance. It is estimated to cost a typical 40-acre vineyard from $2,400 to $87,880 in order to initially comply with its mandates. It will cost an additional $750 to $9,000 per year to keep that 40-acre vineyard in compliance.

7. If I were forced to incur these costs in order to continue to use water for frost control, I would likely have to cease using water for frost control purposes.

8. As a result of not having water available for frost control, I would either: (a) likely cease farming altogether because my crop losses would be so high that it would be difficult to cover my costs in bringing what little fruit I could harvest to market; or (b) reduce the amount of acreage I do farm and either leave the remainder fallow or sell it.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: ____6/24/2011____, 2011
(Month and day)

Signature: ________________

Affidavit on
Frost Protection Use

1. My full name is Robert Terry Rosetti
(Print name)

2. The information contained in this affidavit is based upon my personal knowledge.

3. In the last five years I have used water diverted from the Russian River, or a tributary of the Russian River, for frost protection purposes.

4. I plan on using water for from protection purposes in the future.

5. A ~~significant~~ growing portion of my income is derived from income I receive from selling crops that depend upon using water for frost protection.

6. I have read and am familiar with the State Water Resources Control Board's Draft Notice of Proposed Rulemaking. In this draft document the SWRCB estimates the costs that a 160-acre vineyard owner and a 40-acre vineyard owner could expect to incur to comply with the proposed Russian River Frost protection regulation.

7. If I were forced to incur these costs outlined in the SWRCB document in order to continue to use water for frost control, I would likely have to cease using water for frost control purposes.

8. As a result of not having water available for frost control, I would either: (a) likely cease farming altogether because my crop losses would be so high that it would be difficult to cover my costs in bringing what little fruit I could harvest to market; or (b) reduce the amount of acreage I do farm and either leave the remainder fallow or sell it.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: 6-29, 2011
(Month and day)

Signature:

Affidavit on
Frost Protection Use

1. My full name is Robert Rosetti.
   (Print name)

2. The information contained in this affidavit is based upon my personal knowledge.

3. In the last five years I have used water diverted from the Russian River, or a tributary of the Russian River, for frost protection purposes.

4. I plan on using water for from protection purposes in the future.

5. A significant portion of my income is derived from income I receive from selling crops that depend upon using water for frost protection.

6. I have read and am familiar with the State Water Resources Control Board's Draft Notice of Proposed Rulemaking. In this draft document the SWRCB estimates the costs that a 160-acre vineyard owner and a 40-acre vineyard owner could expect to incur to comply with the proposed Russian River Frost protection regulation.

7. If I were forced to incur these costs outlined in the SWRCB document in order to continue to use water for frost control, I would likely have to cease using water for frost control purposes.

8. As a result of not having water available for frost control, I would either: (a) likely cease farming altogether because my crop losses would be so high that it would be difficult to cover my costs in bringing what little fruit I could harvest to market; or (b) reduce the amount of acreage I do farm and either leave the remainder fallow or sell it.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: 6-24, 2011
(Month and day)

Signature:

Affidavit on
Frost Protection Use

1. My full name is Ronald C Rosetti
(Print name)

2. The information contained in this affidavit is based upon my personal knowledge.

3. In the last five years I have used water diverted from the Russian River, or a tributary of the Russian River, for frost protection purposes.

4. I plan on using water for from protection purposes in the future.

5. A significant portion of my income is derived from income I receive from selling crops that depend upon using water for frost protection.

6. I have read and am familiar with the State Water Resources Control Board's Draft Notice of Proposed Rulemaking. In this draft document the SWRCB estimates the costs that a 160-acre vineyard owner and a 40-acre vineyard owner could expect to incur to comply with the proposed Russian River Frost protection regulation.

7. If I were forced to incur these costs outlined in the SWRCB document in order to continue to use water for frost control, I would likely have to cease using water for frost control purposes.

8. As a result of not having water available for frost control, I would either: (a) likely cease farming altogether because my crop losses would be so high that it would be difficult to cover my costs in bringing what little fruit I could harvest to market; or (b) reduce the amount of acreage I do farm and either leave the remainder fallow or sell it.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 29, 2011
(Month and day)

Signature: Ronald C Rosetti

Exhibit BB

TODD ENGINEERS

GROUNDWATER · WATER RESOURCES · HYDROGEOLOGY · ENVIRONMENTAL ENGINEERING

March 2, 2010

Mr. Jesse W. Barton, Esq.
Gallery and Barton, a Professional Law Corporation
1112 I Street, Suite 240
Sacramento, CA 95814

Re: Proposal to review and evaluate the hydraulic connection (or lack there-of) between the wells used for frost protection and thı Russian River near , CA.

Dear Mr. Barton,

This is a proposal and cost estimate to review available hydrogeologic information in order to evaluate the hydraulic connection (or lack there-of) between the wells (Wells) used for frost protection and the Russian River near , CA. I received from Mr. Nicholas F. Bonsignore of Wagner & Bonsignore, Consulting Engineers on February 19, 2010, an email providing information on water quantities needed for frost protection and following attachments.

- A portion of the USGS 7.5 minute Quadrangle map showing the approximate location of the located about 0.75 miles upstream from the lı along the south bank of the Russian River.
- A deed plat map showing the boundaries of the property.
- An aerial photograph of the property that shows the well locations.
- Copy of the draft regulations by the State Water Resource Control Board (SWRCB) Division of Water Rights on diversion of water from the Russian River for frost protection.

In addition, I received the following information from Mr. ı of
:

- Two documents providing well yield information and showing well locations and numbering.
- Department of Water Resources Well Completion Reports for Wells 1, 2, and 3.
- Water quality analysis for Wells 1, 2, and 3 conducted in 2000

2490 Mariner Square Loop, Suite 215 · Alameda, CA 94501-1080 · 510/747-6920 · Fax 510/747-6921

EXHIBIT BB

The objective of this evaluation is to determine the degree of hydraulic connection between the vineyard wells and the lower Russian River and the impact of the SWRCB Division of Water Rights proposed water diversion for frost protection regulations for the Russian River and associated groundwater usage beneath the property. The following scope of work is based on limited information and assumptions that may require modifications of the tasks as additional information is obtained.

1. Conduct additional research and obtain documents including maps by Stetson Engineers of alluvial stream channels, county soil maps, reports by the USDA Soil and Conservation Service, geologic reports, soil borings, well logs, climatological data, and consultant reports relevant to the hydrogeology, irrigation, and frost protection patterns of the property

2. Compile and examine all available and relevant hydrogeologic information as a basis for designing a pumping test and providing an engineering strategy to mitigate any hydrogeologic data gaps in order to clarify the hydraulic relationship between groundwater pumped from the wells for frost protection and the Russian River.

3. Conduct a site visit to examine the property, water wells, topography, and surface geology.

4. Design a well pumping test (or tests) to measure the potential influence of groundwater extraction on the Russian River stream flows.

5. Perform the pumping test and collect additional data and water samples for analytical analysis.

6. Evaluate results of the pumping test and water chemistry to determine the degree of connection and relative impact on the river flows and stage.

7. Prepare a technical memorandum outlining work performed, data collected and analyzed, findings, and recommendations.

The estimated cost to perform these tasks is $15,000 excluding laboratory costs (about $1,600) and well elevation surveying costs (about $1,000). This cost estimate assumes that one (1) pumping test will be conducted without the assistance of a drilling or pump contractor. The cost does not include the installation of any additional monitoring wells (if recommended).

A 2010 schedule of charges and my resume are included for your review. We can begin this project as soon as we are provided a notice to proceed and agreement to provide a $2,500 retention check, which will be credited to the initial invoice. If the above is agreeable to you, please sign and date below and return a copy of this proposal to me.

Todd Engineers policy is to charge on a time, materials, and expense basis according to the schedule of charges and not-to-exceed the estimated budget without prior client authorization; invoices are monthly.

Please do not hesitate to call me if you have questions. I look forward to working with you on this very interesting project.

Yours truly,

David W. Abbott, P.G., C.Hg.
Senior Geologist
Todd Engineers

Enc. Resume and Fee Schedule

cc:

Exhibit C

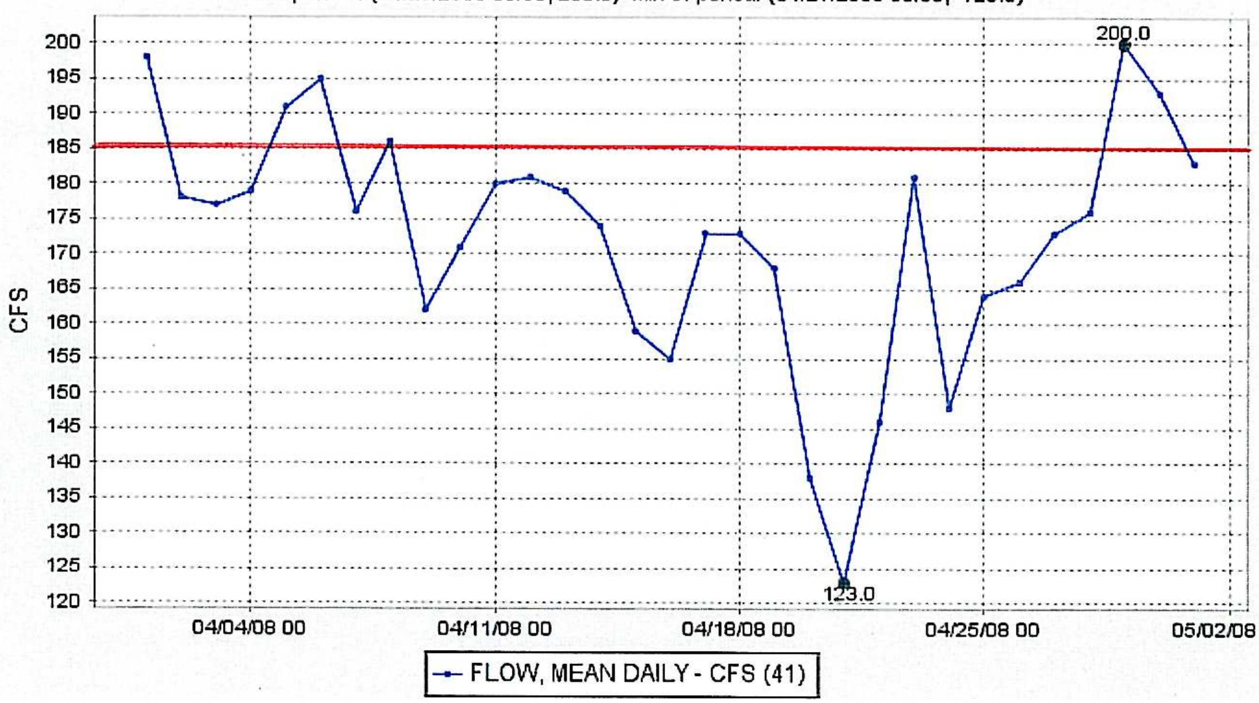
Department of Water Resources

California Data Exchange Center

RUSSIAN RIVER NEAR HOPLAND (HOP)

Date from 04/01/2008 00:00 through 05/01/2008 00:00 Duration : 30 days

Max of period : (04/29/2008 00:00, 200.0) Min of period: (04/21/2008 00:00, 123.0)



Generated on Sat Mar 20 11:36:35 PDT 2010 HOP data | Show HOP Map | HOP Info

Station ID: HOP Sensor No: 41 Duration Code: ○ M ◉ D ○ H ○ E

Start Date: 04/01/2008 00:00 End Date: 05/01/2008 00:00 Plot Size: ◉ Small ○ Medium ○ Huge

Get another plot

EXHIBIT C

Exhibit D

Biological Context of the Spring 2008 De-Watering Event in the Upper Mainstem of the Russian River

National Marine Fisheries Service, Southwest Region
March 2011

Introduction

The cultivation of wine grapes is a major industry in the Mendocino County portion of the Russian River. There are currently an estimated 15,539 acres of wine grapes under cultivation in this region; which represents a 30 percent increase in vineyard acreage over the last 20 years.

A significant challenge to the successful harvest of wine grapes in the upper Russian River is the threat that frost damage poses to crops. In spring, grape vines emerge from their winter dormancy with the initiation of new vegetative growth, which sprouts from buds established in the previous growing season. This "bud break" often coincides with spring frost events. Frost can damage this new tissue and significantly affect the subsequent yield of grapes.

As the frost risk map (Figure 1) indicates, Mendocino County faces a substantially greater frequency (and intensity) of frost events than other areas in the basin. To combat this climatic threat to their crops, growers have increasingly used water, dispersed via overhead sprinklers at a typical rate of 55gal./minute/acre. Water applied in this manner forms a protective layer of ice over the new growth and protects it from frost damage. This practice in conjunction with the expansion of vineyards, has resulted in an intensive demand for water along the mainstem Russian River (Figure 2). The 2008 frost protection events from April 19th to April 23rd resulted in the removal of an estimated 412 acre-feet of water (134 million gallons), as documented at the Hopland gauge.

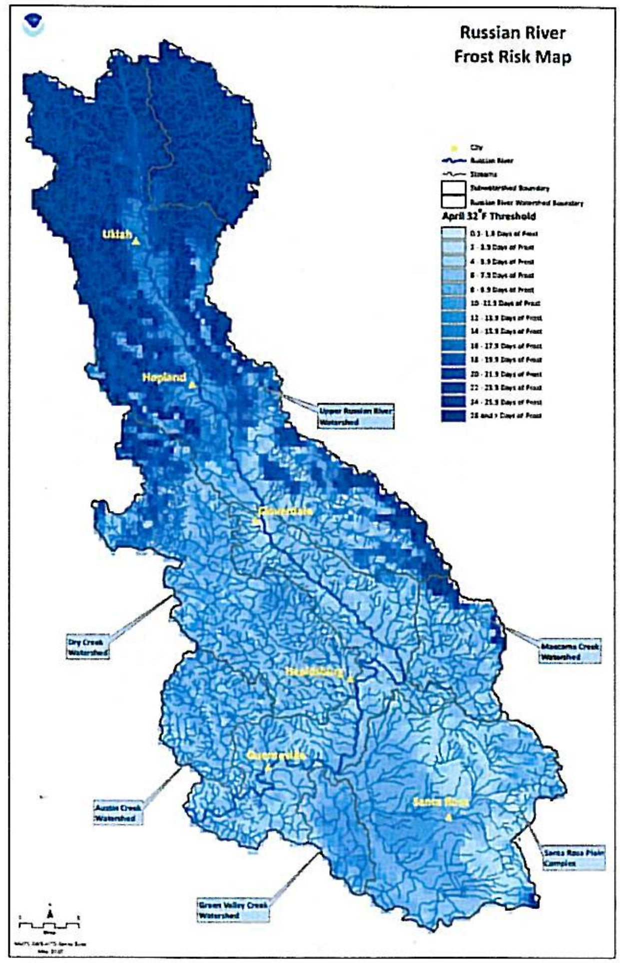


Figure 1. Frost risk map indicating a pronounced increase in the probability of frost events in the Mendocino County portion of the Russian River basin. Product developed by Fox Weather using PRISM climate model and 20 years of data from 16 local weather stations.

EXHIBIT D

2008 Fish Kills

The hydrologic effects of frost protection diversions can coincide with the emergence of salmonid fry from their redds. Fry typically rear in shallow low velocity areas of the stream such as stream margins and side channels. Fry are particularly susceptible to stranding because they occupy shallow habitats, have poor swimming ability and respond to flow changes by seeking refuge in the interstitial species of cobble or gravel substrates which can then dry out. Parr, smolt and even adult salmonids may also get stranded depending on the circumstances. We have observed mortalities of all these life stages in Russian River tributaries associated with frost events.

On the morning of April 20, 2008, during a frost event, a NMFS biologist documented the stranding mortality of 10 steelhead fry along the gravel margins of the mainstem river just north of Hopland (Figure 3). This effort is best described as an opportunistic spot check. The biologist spent approximately 1 hour searching dewatered margins of the river and covered 50 to 75 meters of river length. The biologist's search was limited to a quick scan of the surface to search for stranded fish. Due to the tendency for fry to get stranded in interstitial spaces and other issues with detectability, it is likely a significant portion of stranded fish went undetected even within the small area that was searched.

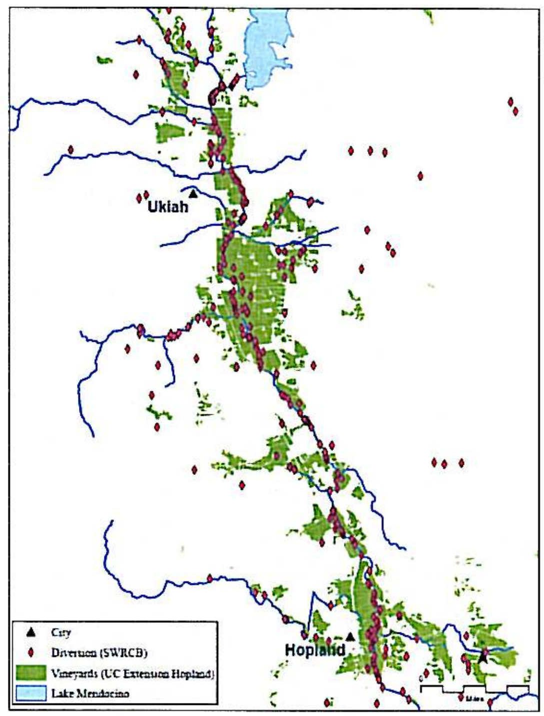


Figure 2. Distribution of vineyards and documented diversions along the Russian River mainstem between Ukiah and Hopland.

Significance of the Threat to Salmonids

Despite the seemingly insignificant nature of the observations of April 20, a consideration of the totality of evidence clearly indicates the fish kill was "substantial" and that it is reasonable to conclude the threat to salmonids is significant. To support this, we first summarize the hydrologic effects, and use that to provide an estimate of the fish kill to indicate the scope of the impact in the mainstem. We then summarize the overall threat, with particular reference to tributary streams.

Figure 3. Salmonid fry mortality observed near Hopland, April 20, 2008.

Though frost protection impacts occur throughout the basin and to a lesser extent in the mainstem below Hopland, we limit our estimate of the 2008 fish kill to the 28 miles of mainstem river from the East Branch/West Branch confluence below Coyote Valley Dam in the northern Ukiah Valley to the USGS gauge north of Cloverdale where hydrologic signals from the frost events were still detected.

Hydrologic Effects: The USGS stream flow gauge on the mainstem Russian River just north of Hopland is located 14.4 miles south of the East Branch/West Branch confluence. This gauge indicates at least 20 discernable stage reductions at low flows associated with air temperatures approaching 32°F between March 15 and May 30, 2008[1] (Figure 4). The most severe event occurred on April 21 when stage dropped 8.5 cm at a rate of 1cm per hour. Although this is not in itself impressive, due to the low gradient configuration of the channel, a drop of that magnitude would expose an 8 foot wide strip of gravel substrate, assuming a cross-sectional slope of 2°. Gravel bars do not occupy the entire channel, but typically form alternating bars interspersed with vegetated banks. For the sake of this estimate, we assume 25 percent of the river channel by length has gravel substrate, side channel, backwater pool, or some other feature where fish could potentially be stranded.

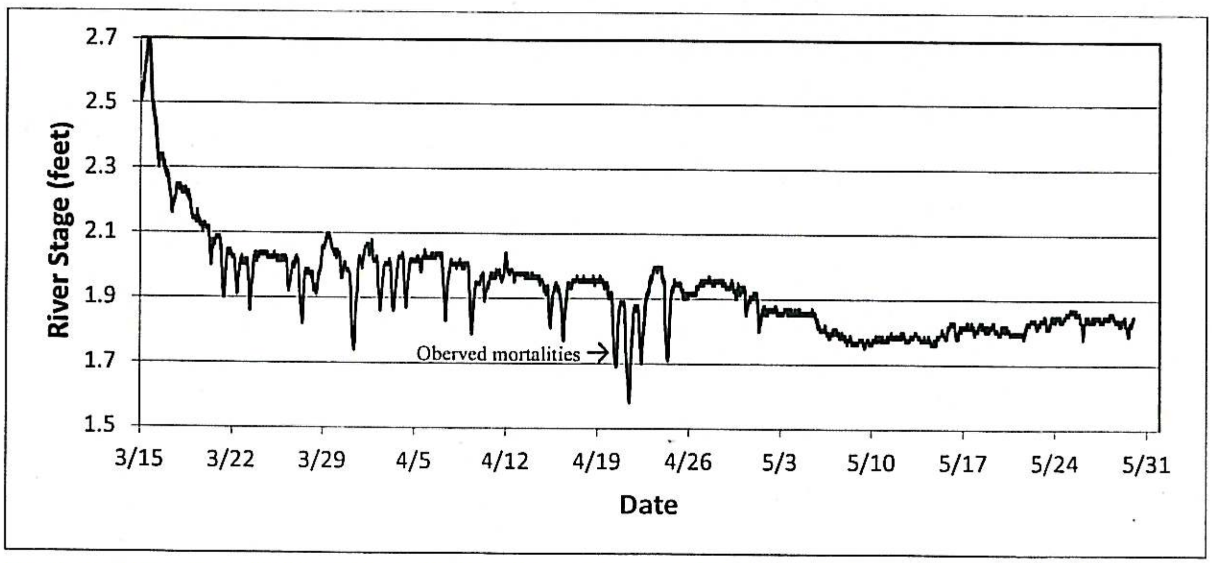


Figure 4. River stage as measured by the USGS gauge near Hopland, California from March 15 to May 30, 2008.

[1] March 15 to May 30 is the period from "bud-break" until the frost events become unlikely with the approach of summer.

Stage changes equal to or greater than those observed here are regular occurrences at higher flows when discharge decreases rapidly after a storm event. What made these events biologically significant was they occurred when stream flows were already very low due to drought conditions[2]. Pre-frost event flows were approximately 250 cubic feet per second (cfs). This volume is low enough, relative to the channel's capacity, that gravel bars and other low-gradient features would be partially exposed. Rapid stage changes at this low flow have no analogue in nature, so fish are likely to have difficulty coping with them (Figure 5).

Estimated Take of Threatened Steelhead: The following estimation may help indicate the scope of the April 2008 events. We make three important assumptions in making this estimate: 1) There was an average stranding density of 10 stranded fish per 100 feet of stream for events equal to that observed on April 20; 2) Stranding density varied by severity of events, and; 3) A constant 25 percent of the river length had features likely to induce stranding during an event. When we applied our calculations to the 28 mile assessment reach, we estimated a total of 25,872 stranding mortalities for 2008 (Table 1). We recognize this is a coarse but conservative approximation which could be modified with quantification of these additional considerations:

- The cumulative effect of diversions would increase the effect in a downstream direction.
- The magnitude and rate of stage change was probably greater at points of diversions than what was documented at the Hopland gauge.
- Channel morphology, especially with respect to the distribution of gravel bars, is unknown and varies.
- Fish density varies in space and time and may be depleted with each event.
- There were additional drawdown events not considered in this estimate.
- Hydrologic effects may have extended beyond the assessment area.

Table 1. Explicit assumptions used to derive estimates of the total number of salmonids killed in the upper Russian River mainstem during the 2008 frost season.

Event Dates	# of Events	Severity	Severity Index	Fish Density	Reach Length	% stranding habitat	Estimated # of Fish
3/23-4/16	10	Less	0.25	2.5/100ft	28 miles	0.25	9,240
4/20	1	Observed	1	10/100ft	28 miles	0.25	3,696
4/21	1	Most	1.5	15/100ft	28 miles	0.25	5,544
4/22	1	Equal to obs.	1	10/100ft	28 miles	0.25	3,696
4/24	1	Equal to obs.	1	10/100ft	28 miles	0.25	3,696
						Total Fish Kill:	25,872

[2] Flow in this reach is regulated by releases from Coyote Valley Dam, so low flow conditions were more directly the result of reduced flow releases intended to maximize reservoir storage under drought conditions.

Whether the actual number of stranded fry was 5,000, or 50,000, it should be apparent that: a) The fish mortality constitutes a substantial threat to the reproductive success of steelhead in the assessment area, and; b) These impacts may negatively influence the survival and recovery of local populations, which may in turn be relevant at the species scale.

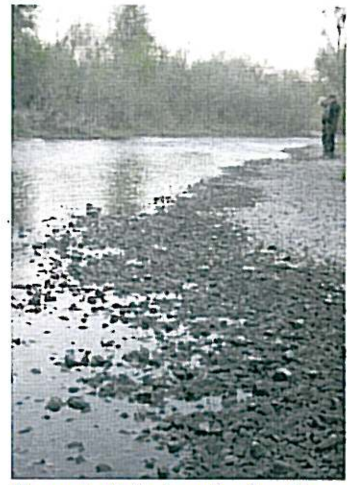


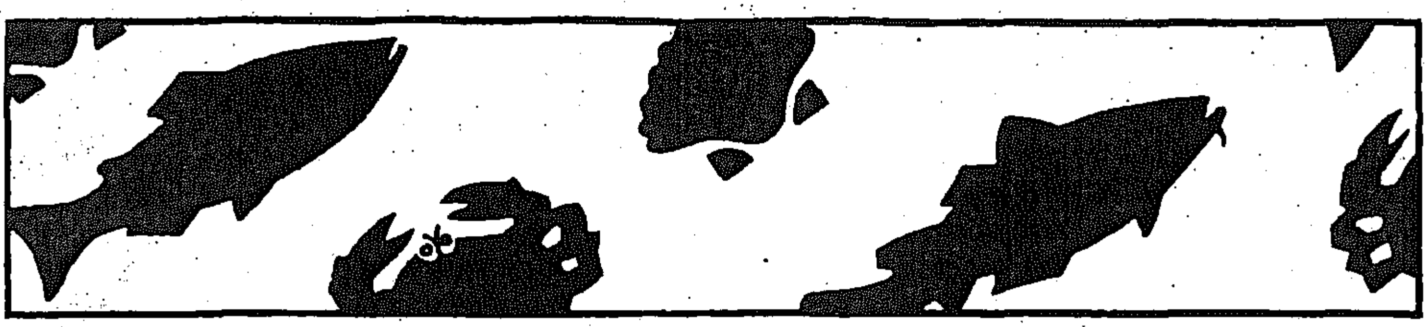
Figure 5. Mainstem Russian River near Hopland on March 31, 2009 during a stage reduction of less than one inch. Note the recently de-watered stream margin.

Tributary Streams: In addition to the 28 miles of mainstem Russian River considered above, there are over 140 miles of tributary stream occupied by steelhead above that point. Tributaries not only constitute many more stream miles than the mainstem, they typically provide higher quality spawning and rearing habitat as well. For steelhead, the bulk of spawning and rearing therefore takes place in the tributaries when seasonal precipitation provides enough stream flow for adults to ascend them[3]. In dry years however, as was the case in 2008, there is limited access to the tributaries, so a larger proportion of the steelhead run are forced to spawn in the mainstem.

Although the threat of frost protection is clearly significant in the mainstem, we believe the threat to salmonids in tributaries is even greater. First, as it is with Mendocino County, tributaries throughout the Russian River basin provide the great majority of habitat for salmonids; impacts in those areas therefore threaten to harm a far greater portion of salmonid populations. Secondly, flow is typically less in the smaller tributary channels than in the larger mainstem, so cumulative water demands can more easily overtake supply and result in significant stream desiccation. Published research in Maacama Creek, a Sonoma County tributary to the Russian River, documented up to 97% stream flow reductions associated with episodic frost protection activities.

[3] Chinook salmon however, tend to be restricted to the mainstem and lower reaches of the major tributaries.

Exhibit E



State of Washington Department of Fisheries

HYDROPOWER FLOW FLUCTUATIONS AND SALMONIDS: A REVIEW OF THE BIOLOGICAL EFFECTS, MECHANICAL CAUSES, AND OPTIONS FOR MITIGATION

by

Mark A. Hunter
Fish Biologist
Habitat Management Division

September 1992

Technical Report

Number: 119

EXHIBIT E

TECHNICAL REPORTS

The Technical Reports present results of completed or ongoing investigations carried out by the Department of Fisheries that are deemed of sufficient timely interest to be made available to the scientific community and the public.

The contents of these reports may be reprinted, and reference to the source will be appreciated.

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DEPARTMENT OF FISHERIES

TECHNICAL REPORT NO. 119

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Executive Summary

This technical report reviews the available research and evaluations on the effects of flow fluctuations on salmonids. It also summarizes how hydropower facilities create flow fluctuations, suggests criteria for mitigation, recommends field procedures, and identifies needs for further research. This technical report is limited to the review of flow fluctuations and does not address flow alterations.

Flow alterations are changes from the natural or unregulated flow that persist for weeks, months, or seasons, either as a result of water storage or as a result of bypassing a section of the river with a penstock. Flow alterations change the amount of habitat available to fish and, thus, change the capacity of the river to produce fish.

Flow fluctuations are unnatural changes in flow over periods of minutes, hours, or days. The biological impacts include immediate mortality, delayed mortality, temporary loss of habitat, reduced reproductive success, loss of food resources, and behavioral responses that could reduce survival or growth. The effects of flow fluctuations are not well-understood by many biologists outside the Pacific Northwest involved in hydropower mitigation, and many site-specific investigations completely ignore the impact of flow fluctuations.

The physical hydraulics of unregulated (i.e., natural) and regulated (i.e., hydropower controlled) rivers are compared to emphasize that unregulated rivers rarely experience drops in stage (i.e., water surface elevation) in excess of two inches per hour, except during floods, whereas regulated rivers may experience a much higher frequency at low and medium flows. Thus, aquatic life forms are not necessarily adapted to stage drops in excess of one or two inches per hour.

The most widely studied biological impact is stranding. Stranding has killed hundreds of thousands of juvenile salmon in single events. The incidence of stranding is affected by the life history stage of the fish, substrate type, river channel contour, range of flow change, rate of flow change, species, and time of day.

Other biological impacts have not been as thoroughly evaluated. These include redd dewatering, invertebrate productivity, fish emigration, and spawning interference. These impacts can be quite significant under some circumstances.

Hydropower facilities cause flow fluctuations in a variety of ways. Successful mitigation requires a thorough understanding of the operation practices and malfunctions that cause flow fluctuations. It is not sufficient to list criteria specifying allowable hydraulic changes. Developers often fail to recognize or acknowledge all sources of flow fluctuations, and when facilities are built that fail to address all potential sources of flow fluctuations, they will resist unanticipated and often costly alterations of their facilities or changes to their operation procedures. An overview of mechanical causes and suggested mechanical and hydraulic criteria are provided.

This report ends with a discussion on the significance of biological impacts relative to other types of hydropower impacts. The impact of flow fluctuations has been ignored in many site-specific evaluations and in most comprehensive reviews. Informational deficiencies and additional research needs are also discussed.

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1. Acknowledgements

I should first acknowledge the efforts of the numerous individuals that performed the field work and reported their results in journals, technical reports, and hydropower license applications. Needless to say, this review would be impossible without such a foundation. Special thanks to Kevin Bauersfeld and Rod Woodin. These individuals performed some of the basic field research and provided encouragement and suggestions. Ross Fuller and Bob Gerke were also supportive and patiently reviewed multiple drafts of the report. Hal Beecher, Dawn Whitehead, Steve Fransen, and Stephanie Birchfield all provided external review of a preliminary draft. Phil Hilgerth, Carl Hadley, Al Solonski, and Tom Higgins provided key pieces of data or key ideas. Kurt Fresh and Linda Thunell assisted with polishing the document.

2. Introduction. This section defines the scope of this review.

Hydropower facilities can, to varying capacities, change instream flow patterns in rivers below the dams and powerhouses. These changes can be classified into two categories, flow alterations and flow fluctuations.

Flow alterations are changes in flow over long periods of time (weeks, months, or seasons) resulting from the storage of water, irrigation diversions, municipal diversions, or the reductions of flow between dams and powerhouses. These changes in net flow usually change the availability of fish habitat, and thus change the fish production potential of a river. Flow alterations are evaluated by studying the fish habitat requirements and estimating the changes in habitat area at different flows using a hydraulic model. The Instream Flow Incremental Methodology (IFIM) (Bovee 1982) has become a standard method for estimating habitat changes resulting from flow alterations. The IFIM methodology is routinely used to facilitate negotiation of instream flow requirements, usually minimum flow requirements, that meet the habitat needs of economically important or threatened fish species.

Flow fluctuations are unnaturally rapid changes in the flow over periods of minutes, hours, and days. Flow fluctuations can be immediately lethal or have indirect and delayed biological effects. This report reviews the **only** impacts of flow fluctuations on salmonids resulting from hydropower activity.

This report is divided into seven sections including:
(1) The difference between rivers regulated for hydropower and unregulated rivers; (2) The biological effects of flow fluctuations; (3) The hydraulic response of flow fluctuations over time and distance; (4) The types of hydropower activity that causes flow fluctuations; (5) Mitigation measures; (6) Field Methods; and (7) A concluding discussion. Anadromous salmonids *(Oncorhynchus spp.)* are emphasized, reflecting the available information on the subject. Most of the research and evaluation regarding the effects of flow fluctuations on salmonids has occurred in the states of Washington and Oregon. The discussion herein assumes the biological, geological, and hydrological characteristics of these states. Unless otherwise noted, geographical names are implicitly located in Washington State.

Flow fluctuations can be measured either by changes in **flow**, which is the volume of water passing a specific river transect, or by changes in **stage**, which is the water surface elevation or gage height. Both units are needed to understand the problem, and the terms are used interchangeably in this text. Hydrologists and engineers require flow measurements for many applications; however, the biological impact of flow fluctuations is best measured by stage. These two units do not have a simple functional relationship, thus **rating tables** or **rating curves** are used to define the flow at each stage for a specific river transect.

3. Unregulated and Regulated Rivers. This section describes the difference between unregulated and regulated rivers.

Flows in unregulated rivers respond to changes in precipitation and snow melt. West of the Cascade Range, the peak flows occur from heavy rain storms in November, December, and January. A lesser but more sustained peak occurs from a combination of rain and snow melt in the spring. The lowest flows coincide with the dry season that occurs in late summer and early fall. Glacial streams and streams on the east side of the Cascades have a somewhat different pattern. Here, the highest flows often occur in the spring and extend into the early summer. The lowest flows in some years occur during cold periods in the winter. In either case, periods of heavy rainfall or dry weather can create flows that are above or below seasonal averages. These natural flow variations indirectly affect fish production as a result of changes in the quantity and quality of instream habitat.

On a shorter time scale, individual storms can rapidly increase river stage in less than a day. After the storm, the stage declines to a relatively stable level over a longer period of time, usually days or weeks. In addition to storm events, limited daily stage changes sometimes occur during sunny weather as a result of snow melt run-off. Both types of natural flow changes are illustrated in Figure 1, which shows the hydrographs of three Snoqualmie River gages. This graph plots the river stage responses to a storm (April 4 through 8) and to snow melt (April 10 through 14).

Tabulation of hourly changes in stage provides insight on natural changes in flow. The first example is Youngs Creek, a medium sized stream located in the westside foothills of the Cascades. The hourly stage of Youngs Creek were recorded for a 15-month period, resulting in 11,771 observations of stage change (Table 1). Of these observations, there were 3182 records of no change, 3199 records of increases, and 5390 records of decreases. The number of decreases exceed increases because increases are typically greater in magnitude, and thus, it takes a greater number of decreases to offset the increases.

This data was tabulated by month and flow exceedence ten-percentiles. The most severe fluctuations occurred in late fall and winter (Table 1) and most stable flows occurred during the August and September dry season. As might be expected, the rate of change in stage is related to total flow or stage (Table 2). It is important to note that stage <u>decreases</u> in excess of 2 inches per hour did not occur in the lower 80 percent of the flow range. Only in the highest 10 percent of the flow range did stage decreases routinely exceed 2 inches per hour. In contrast, stage <u>increases</u> above 2 inches an hour occasionally occurred in the lowest 80 percent of the flow range.

In a second example, hourly stage changes in adjacent regulated and unregulated rivers were tabulated for comparison. The Sauk River and upper Skagit River (Marblemount gage) are rivers of similar size. Both rivers originate from the North Cascades mountains. The Sauk River is unregulated, and the upper Skagit River is regulated by three dams. The discharge from the lowest dam is subjected to daily flow fluctuations during parts of the year as a result of changes in demand for electric power (load following).

Nearly two years of data (October 1, 1989, to September 19, 1991; 17,244 observations) are tabulated for comparison. The distribution of flow fluctuations for the Sauk River (Table 3) is quite similar to that for Youngs Creek (Table 2). Only one record of decline in stage of 2 inches or greater occurred in the lower 90 percent of the flow range. Ninety-seven observations of declines in flow greater or equal to 2 inches per hour occurred in the highest 10 percent of the flow range.

By contrast, the Skagit River gage recorded 391 events of stage declines of greater than or equal to 2 inches per hour in the lower 90 percent of the estimated natural flow range, including four events in the lowest 10 percent of the natural flow range (Table 4). Despite significant moderation of discharge fluctuations at the lowest dam in recent years, the rate of change in the river flow is still highly unnatural.

In summary, rapid decreases in stage rarely occur in unregulated rivers, except during or immediately after floods. Thus riverine life forms are not necessarily adapted to survive such events. Landslides and rock falls can cause rapid flow decreases unrelated to floods, however, such events are rare and are unlikely to induce natural selection or learned behavioral responses in aquatic animals.

4. **The Biological Impacts of Flow Fluctuations. This section describes all known biological impacts that result from flow fluctuations.**

a. Increases in Flow

Evidence of biological impacts from rapid flow increases is scarce. Some impacts associated with rapid flow increases might be more appropriately associated with high flows. Rochester et al. (1984) noted that eggs and alevins can be killed when gravel scour occurs, and juvenile fish may be physically flushed down the river. Some species of aquatic insects that swim in pools can be physically flushed downstream from a sudden increase in flow (Trotzky and Gregory 1974, cited in Cushman 1985).

In an event observed by the author, a very rapid increase in flow (approximately 200 cfs to 1800 cfs in less than 30 minutes) on the North Fork Skokomish River was determined to have little or no direct impact on the salmonid population. Before and after index counts of juvenile salmonids were possible because an instream flow study was underway at the time. No significant difference in index counts could be determined (unpublished data, Chas Gowan, Harza NW, Bellevue, WA). However, indirect effects (i.e., aquatic invertebrates, long-term condition and survival of juvenile salmonids) were not assessed. It should be noted that the subsequent decline in flow did kill some fish.

The biological effects of unnatural flow increases are usually irrelevant in regulating hydropower operations because public safety concerns justify more stringent regulations than biological concerns. Flow increases can strand and occasionally drown fishermen and other people located on bars, rocks, or in confined canyons. Boaters might also be at risk under some circumstances. The remaining discussion in this review deals exclusively with the effects of decreases in flow.

b. Stranding

Stranding is the separation of fish from flowing surface water as a result of declining river stage. Stranding can occur during any drop in stage. It is not exclusively associated with complete or substantial dewatering of a river. Stranding can be classified into two categories: Beaching is when fish flounder out-of-water on the substrate. Trapping is the isolation of fish in pockets of water with no access to the free-flowing surface water. Stranding cannot always be neatly classified as beaching or trapping. Thus the text herein uses the term stranding unless a more specific term is appropriate.

Salmonid stranding associated with hydropower operations has been widely documented in Washington and Oregon (e.g., Thompson 1970; Witty and Thompson 1974; Phinney 1974, 1974b; Bauersfeld 1977, 1978; Becker et al., 1981; Fiscus 1977; Saiterwaite 1987; Olson 1990). Stranding can occur many miles downstream of the powerhouse (Phillips 1969; Woodin 1984). The estimated numbers of fish stranded in flow fluctuation events range from negligible to 120,000 fry (Phinney 1974). Stranding mortality is difficult or impossible to estimate (See Section 8.b.). Estimates are usually very conservative and/or highly variable.

Stranding can also occur as a result of other events, including natural declines in flow (author's obs), ship wash (Bauersfeld 1977), municipal water withdrawals, and irrigation withdrawals. Many factors affect the incidence of stranding. A recurrent theme in much of the following discussion is the high vulnerability of small salmonid fry.

i. **Life History Stage.** Juvenile salmonids are more vulnerable to stranding than adults. Salmonid fry that have just absorbed the yolk sac and have recently emerged from the gravel are by far the most vulnerable. They are poor swimmers and settle along shallow margins of rivers (Phinney 1974, Woodin 1984), where they seek refuge from currents and larger fish. Once chinook attain the size of 50 to 60 mm in length, vulnerability drops substantially. For steelhead, vulnerability drops significantly when the fry reach 40 mm (Beck Assoc. 1989). Larger juveniles are more inclined to inhabit pools, glides, overhanging banks, and midchannel substrates, where they are less vulnerable to stranding. However, many juveniles still inhabit shoreline areas, and remain vulnerable to stranding until they emigrate to saltwater (Chapman and Bjorn 1969, Hamilton and Buell 1976). Adult stranding as a result of hydropower fluctuations has been documented (Hamilton and Buell 1976).

ii. **River Channel Configuration.** The river channel configuration is a major factor in the incidence of stranding. A river channel with many side channels, potholes, and low gradient bars will have a much greater incidence of stranding than a river confined to a single channel with steep banks.

Large numbers of small fry die from beaching on **gravel bars** when unnatural flow fluctuations occur (Phillips 1969; Phinney 1974; Woodin 1984). Bauersfeld (1978) observed beaching primarily on bars with slopes less than 4 percent. Beck Assoc. (1989) determined that beaching occurred primarily on bars with slopes less than 5 percent. Under laboratory conditions, Monk (1989) determined that chinook fry stranded in significantly larger numbers on 1.8 percent slopes than on 5.1 percent slopes, however, results were not significant for steelhead. Stranding on steep gravel bars (>5 percent slope) has not been thoroughly studied.

Long side channels with intermittent flows are notorious for trapping juvenile fish. Substantial trapping can occur even with unregulated flows (Hunter, pers. obs.). Side channels are valuable rearing habitats, and juveniles of several species prefer side channels over the main channel. However, unnatural fluctuations will repeatedly trap fish, eventually killing some or all of them (Witty and Thompson 1974, Hamilton and Buell 1976, Woodin 1984, Olson 1990). Side channels can trap substantial numbers of fingerlings and smolts (up to 150 cm) as well as fry.

As water recedes from river margins, juvenile salmonids may become trapped in deep pools called **potholes** (Woodin 1984; Stokes and Jones Assoc. 1985). Potholes are formed at high flows from scouring around boulders and rootwads and where opposing flows meet. Potholes may remain watered for hours or months depending on depth of the pothole and the river stage. R.W. Beck Assoc. (1989) extensively studied pothole stranding in the Skagit River. Among the conclusions were: 1) Only a small fraction of the potholes in a river channel posed a threat to fish if fluctuations are limited in range; 2) The incidence of stranding is independent of the rate of stage decrease; and 3) The incidence of stranding was inversely related to the depth of water over the top of each pothole at the start of the decline in flow.

iii. **Substrate Type.** Most documented observations of stranding have occurred on gravel; however, stranding has also occurred in mud (Becker et al. 1981) and vegetation (Phillips 1969, Satterthwaite 1987).

Under laboratory conditions, Monk (1989) found significantly different rates of stranding on different types of gravel. In fact, substrate was statistically the most significant factor contributing to stranding of chinook and steelhead fry. On cobble substrate, fry (especially steelhead fry) were inclined to maintain a stationary position over the streambed (i.e., rheotaxis); while over small gravel, fry swam around, often in schools. When the water surface dropped, fry maintaining their position became trapped in pockets of water between cobbles, whereas mobile fish were more inclined to retreat with the water margin. When beaching became imminent, fry over cobble substrate retreated into inter-gravel cavities, where they became trapped. The difference in stranding rate was facilitated by the flow of water along a receding margin of the stream. On cobble substrate, the water drained into the substrate, whereas on finer substrates, a significant portion of the water flowed off on the surface.

iv. **Species.** Fry of some species are more vulnerable to stranding than others. In Washington State, stranding of chinook and steelhead fry have been frequently observed. Although pink salmon fry and chum salmon fry occur in the same rivers, they strand in lower numbers than chinook fry and steelhead fry (Woodin 1984). However, Beck Associates (1989) determined that the <u>rate</u> of chum and pink fry stranding per the available fry was substantially higher than for chinook. The low numbers of pink and chum salmon stranding is a result of the short fresh water residency; They emigrate to salt water shortly after emergence, whereas chinook and steelhead remain in the river for months or years.

Hamilton and Buell (1976) observed extensive coho stranding in the Campbell River (British Columbia) and coho stranding has been observed in incidental numbers in other studies (Woodin 1984, Olsen 1990). The overall incidence of coho stranding is rather low in the studies conducted to date. The likely reason for this is that coho prefer streams for spawning and rearing, whereas the formal research and evaluation has taken place in large and medium rivers. Juvenile coho rear for a full year in fresh water, and thus, it is reasonable to assume that stranding would occur at rates similar to chinook and steelhead.

Several episodes of sockeye salmon fry stranding have occurred in the Cedar River as a result of flow fluctuations (Fiscus 1977). Hvisten (1985) documents atlantic salmon and brown trout stranding in Norway.

v. **Ramping Range.** The ramping range or the total drop in stage from an episode of flow fluctuation affects the incidence of stranding by increasing the gravel bar area exposed. In addition, it increases the number of side channels and potholes that become isolated from surface flow (Beck Assoc. 1989).

vi. **Critical Flow.** Stranding increases dramatically when flow drops below a certain water level, defined as the critical flow (Thompson 1970, Phinney 1974, Bauersfeld 1978, Woodin 1984). In hydropower mitigation settlements, the critical flow is defined as the minimum operating discharge, or as an upper end of a flow range where more restrictive operation criteria are applied. The factors that likely account for this response have been discussed above. The exposure of the lowest gradient gravel bars often occurs in a limited range of flows. The exposure of spawning gravel from which fry are emerging may also account for the higher incidence of stranding.

vii. **Frequency of Flow Reductions.** In rivers with seasonal side channels and off-channel sloughs, even a natural flow reduction can trap fry and smolts. Under normal circumstances, the natural population can sustain a small loss several times a year. However, when a hydropower facility causes an repeated flow fluctuations, these small losses can accumulate to a very significant cumulative loss (Bauersfeld 1978).

viii. **Ramping Rate.** The ramping rate is the rate of change in stage resulting from regulated discharges. Unless otherwise noted, it refers to the rate of stage decline. The faster the ramping rate, the more likely fish are to be stranded (Phinney 1974, Bauersfeld 1978). Ramping rates less than one inch per hour were needed to protect steelhead fry on the Sultan River (Olson 1990)[1].

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[1] Olson determined that ramping rate of 1 inch per hour was adequate to protect steelhead fry. However, the ramping rate was measured at a confined river transect, whereas the stranding was observed on lower gradient bars further downstream. Thus, the effective ramping rate at these bars was less than one inch per hour.

Although many hydropower mitigation settlements specify ramping rates, some research has indicated that ramping rates cannot always protect fish from stranding. Woodin (1984) determined that <u>any</u> daytime ramping stranded chinook fry. Beck Assoc. (1989) could not find any correlation between the ramping and the incidence of pothole trapping, nor was there any correlation between the ramping rate and steelhead fry stranding during the summer. In both cases, stranding occurred regardless of the ramping rate.

ix. **Time of year.** Small fry are highly vulnerable to stranding and are present in the streams only at certain times of the year. Chinook, coho, pink, and chum fry emerge during late winter and early spring while steelhead emerge in late spring through early fall (Olson 1989). Fingerlings, smolts, and adults are vulnerable to stranding in other seasons; however, less restrictive ramping criteria is often sufficient to protect them.

x. **Time of Day.** For at least some species, the incidence of stranding is influenced by the time of day. Chinook fry are less dependent on substrate for cover at night and thus are less vulnerable to stranding at night (Woodin 1984). Two studies (Stober et al. 1982, Olson 1990) concluded that steelhead fry are less vulnerable during the day, presumably because this species feeds during the day. However, two other studies (Beck Assoc. 1989, Monk 1989) found no difference in the rate of steelhead fry stranding relative to day and night.

xi. **Duration of Stranding.** Salmonids respire using their gills and do not survive out of water for more than ten minutes. Thus beaching is always fatal. Juvenile salmonids trapped in side channels and potholes can survive for hours, days, or under favorable circumstances, months (author's pers. obs.). However, many trapped fish die from predation, temperature shock, and/or oxygen depletion. Survivors that are rescued by higher flows are probably in poorer condition than fish in the free-flowing channel.

xii. **Flow Stability Prior to Drop in Flow.** Some observations suggest that a highly stable flow regime for a week or more prior to a flow fluctuation will increase the incidence of fry stranding (Phinney 1974b). Two hypotheses might explain this observation. One hypothesis states that after long periods of stable flow, more fry are available for stranding. In other words, a major flow reduction after a week of stable flows strands seven daily cohorts of emerging fry at once, rather than one cohort when fluctuations occur daily. An alternative hypothesis is that juveniles become accustomed to residing and feeding along the margins of a stream either as a behavioral response to stable flows or in response to aquatic invertebrate populations that thrive along the water's edge under stable flows. These hypotheses should be thoroughly tested before they are applied to mitigation practices.

c. Juvenile Emigration (Salmonid Drift)

Flow fluctuations in an experimental stream channel caused juvenile chinook to emigrate downstream (McPhee and Brusven 1976). The pre-test rate of emigration under stable flows was about one percent a day. Severe flow fluctuations (from 51 liters/sec to 17 to 3 to 51 with each flow held for 24 hours) caused 60 percent of the chinook to emigrate. A high rate of emigration continued even after initial flows were reestablished. A less-severe daily fluctuation in flow (between 51 and 17 liters/sec for four 24-hour periods) caused 14 percent of the chinook to emigrate. Alternating flows between 51 liters/sec and 17 liters/sec every 24 hours cause a greater rate of emigration than alternating the same flows every 12 hours. Most of the emigration occurred at night, a behavior observed in aquatic invertebrates.

The behavioral response to flow fluctuations and how this may affect the juvenile salmonid rearing capacity is not well understood. Under conservative ramping requirements, flow fluctuations may cause downstream emigration, driving many fish habitat that may be less desirable or overcrowded and leaving upstream rearing habitat under-utilized. This could be a particular concern in a stream with a falls or other barrier that prevents juveniles from returning upstream.

d. Increased Predation

Phillips (1969) suggested that juvenile fish forced from the river margins as a result of declining flows suffer from predation by larger fish. This effect has not been documented anywhere to my knowledge; however, it is a credible hypothesis under some circumstances.

e. Aquatic Invertebrates

Like fish, aquatic invertebrates are not necessarily adapted to unnatural drops in flow. Cushman (1985) extensively reviewed the effects of flow fluctuations on aquatic life, especially aquatic invertebrates. Interested readers should read this review. Rather than his duplicate efforts, I will briefly summarize the topic and discuss several regional studies.

Research on the effects of flow fluctuations on aquatic invertebrates in the Pacific Northwest is limited, although more information is available elsewhere in North America. These studies suggest that aquatic invertebrates can be severely impacted by flow fluctuations. Fluctuations substantially reduce invertebrate diversity, total biomass and changes the species composition under most circumstances. One study from the Skagit River found that flow fluctuations had a greater adverse impact on the aquatic invertebrate community than a substantial reduction in average flow (Gislason 1985). The reduction in the aquatic invertebrate production can impact salmonid production as a result of reduced feeding (Cushman 1985; Schlosser 1982).

Additional research is needed on the effects of flow fluctuations on aquatic invertebrates in the Pacific Northwest. However, a thorough study would be a formidable task. It would involve many species with different life cycles, behavioral responses, lethal responses, and contributions as prey to salmonids. Populations of some species may change rapidly under normal conditions, thus it may be difficult to associate cause and effect.

Flow fluctuations can impact the aquatic invertebrates in the following ways:

i. **Stranding.** Flow fluctuations can strand many species of aquatic invertebrates, much in the same way fish can become stranded (Phillips 1969; Gislason 1985). Death may result from suffocation, desiccation, temperature shock, or predation.

ii. **Increased Drift.** Many aquatic invertebrates are sensitive to reductions in flow, and respond by leaving the substrate and floating downstream. This floating behavior is called drift. Night time drift is normal; however, drift becomes highly elevated under unnatural fluctuations in flow (McPhee and Brusven 1975; Cushman 1985). This elevated drift may be an emergency response to avoid stranding, or a response to overcrowding of the inter-gravel habitat, or it may be a response by aquatic species are adapted to a narrow range of water velocity. This response may temporarily increase fish food supply (McPhee and Brusven 1975), but when repeated fluctuations occur, many species are flushed out of river reach and the aquatic invertebrate biomass usually declines, often substantially (Cushman 1985, Gislason 1985). Elevated drift also occurs in response to sudden increases in flow, which captures terrestrial insects from the river banks and scours some aquatic invertebrates from the river substrate (Mundie and Mounce 1976).

iii. **Detritus Feeders.** Under stable flow conditions, floating detritus (leaves, woody debris) accumulates on the shores of the river as a result of current and wind action on sand or gravel substrate. This detritus remains close to the river margin and often remains damp for days or weeks at a time. Under fluctuating flows, this organic detritus becomes suspended (Mundie and Mounce 1976) and is flushed out of the river or redeposited at the high waterline where it desiccates during low flow periods. As a result the invertebrate detritus community is less capable of exploiting this resource.

iv. **Herbivorous Invertebrates.** Impacts are similar to that on the detritus community. Algae grows on exposed rock surfaces on which herbivorous aquatic invertebrates graze. Fluctuations desiccate and disrupt the growth of the exposed algae (Gislason 1985) and reduces access by herbivores.

f. Redd Dewatering

Research has extensively documented the lethal impact of redd dewatering on salmonid eggs and alevins (i.e., larval fish) (Fraley and Graham 1982, Fraser 1972, Satterthwaite et al., 1985, Fustich et al., 1988). Salmonid eggs can survive for weeks in dewatered gravel (Stober et al., 1982; Reiser and White 1983; Becker and Neitzel 1985; Neitzel et al., 1985), if they remain moist and are not subjected to freezing or high temperatures. The necessary moisture may originate from subsurface river water or from ground water. If the subsurface water level drops too far, the inter-gravel spaces will dry out, and the eggs will desiccate and die. Thus redd dewatering is not always lethal or even harmful to eggs. However, site specific conditions, weather and duration of exposure all affect survival.

Because alevins rely on gills to respire, dewatering is lethal (Stober et al., 1982, Neitzel et al., 1985). Alevins can survive in subsurface, inter-gravel flow from a river or ground water source. If inter-gravel spaces are not obstructed with pea gravel, sand, or fines, some alevins will survive by descending through inter-gravel spaces with the declining water surface (Stober et al., 1982). Both alevins and eggs may die from being submerged in stagnant water. Standing inter-gravel water may lose its oxygen to biotic decay, and metabolic wastes may build up to lethal levels.

A redd can be dewater between spawning and hatching without harm to the eggs under some circumstances, and in one situation, a hydropower facility is operated to allow limited redd dewatering (Neitzel et. al. 1985). However, in most Pacific Northwest rivers, anadromous fish spawn over an extended period. Different species spawn in different seasons and individual species may spawn over a range of two to six months. As a result, when eggs are present, alevins and fry are also present, both of which are highly vulnerable to flow fluctuations.

g. Spawning Interference

Bauersfeld (1978b) found that repeated dewatering caused chinook salmon to abandon attempts to spawn and move elsewhere, often to less desirable or crowded locations. Hamilton and Buell (1976) performed a highly detailed study using observation towers situated over spawning beds to track activity on the spawning bed and to observe individual tagged fish. They observed that spawning chinook were frequently interrupted by flow fluctuations. Females repeatedly initiated redd digging, and then abandoned the redd sites when flows changed. They concluded that flow fluctuations decreased viability due to untimely release of eggs, failure to cover eggs once they were released, and a failure of males to properly fertilize eggs laid in incomplete redds. Other researchers had conflicting conclusions. Stober et. al. (1982) noted that chinook salmon successfully spawned in an area that was dewatered several hours a day, and Chapman et. al. (1986) found that eight hours a day of dewatering still permitted successful spawning.

5. The Hydraulic Response to Flow Fluctuations. This section describes the downstream physical response to fluctuation events.

a. Attenuation

The ramping rate attenuates as a function of the distance downstream from the source of a fluctuation event (e.g., Nestler, Milhous, and Layzer 1989). The characteristics of the river greatly influences this attenuation. A fluctuation in flow passing through a narrow bedrock river channel will experience little or no attenuation. Pools, side-channels, and gravel bars attenuate the ramping rate by storing water from higher flows and release this water gradually. Tributary inflow will attenuate the ramping rate and the ramping range. Hydraulic equations (e.g., unsteady flows; Chow 1959 p. 528) exist to describe these responses. A verbal description and examples of downstream responses are provided below.

Figure 2 shows the progression of a fluctuation as it moves downstream past four U.S. Geological Survey gages on the Skagit River. The "hump" that progresses from left to right represents an experimental flow fluctuation requested by fisheries agencies to determine ramping rates and stranding activity. Table 5 tabulates the ramping range, maximum ramping rate, and total duration of decline in flow at each station in response to this event. The ramping range and ramping rate become less as the fluctuation event progresses down the river.

In a similar study in the Deschutes River (Oregon), the ramping range attenuated from 1.6 feet to 1.2 feet over 55.7 miles of river. The ramping range was 0.35 feet 99.7 miles downstream of the powerhouse (Phillips 1969). Attenuation does not occur in uniform increments over distance. Figure 3 plots the data from a load rejection test at the Snoqualmie Falls Project conducted on July 17, 1990. Observers monitored staff gages at six sites downstream from the powerhouse. The farthest site was 4.6 miles downstream. Note that the contour of the water surface overtime was different at each site. Furthermore, the maximum decrease in stage did not occur at the site closest to the powerhouse but at the fifth of six sites. The river channel shape and gradient in the vicinity of each site influences the stage contour. Thus the interpolation and extrapolation of data to derive estimates of ramping rates and ramping ranges for other sections of the river should be avoided. Never-the-less, significant attenuation is evident when the sixth experimental gage data is compared with data from a U.S. Geological Survey gage located 14 miles downstream (Figure 4).

b. Lag Time

Lag Time can be the time it takes for a fluctuation to pass from one place to another on a river. In Figure 2, it took over 7 hours for a fluctuation event to pass through 40 miles of a large river at medium flow. In Figure 4, it took over 5 hours for a fluctuation event to pass through 17.2 miles of medium-sized river at low flows. Phillips (1969) documents a 20.5 hour time lag on the Deschutes River (Oregon) over 99.7 river miles. The river channel configuration, gradient, and flow all influence the speed at which the fluctuation travels downstream. Lag time can be determined by field observations at several flows.

Lag time is important when different ramping rates are required for day and night. On the Skagit River, it took 7.5 hours for a drop in flow to pass through all the chinook fry rearing habitat (Woodin 1984). From this, it was recommended that down ramping end 6.5 hours before sunrise to provide sufficient protection for the chinook fry.

For projects with long penstocks, the term **bypass lag time** refers to the time flow fluctuations take to pass down the natural stream channel from the dam to the powerhouse tailrace.

6. Types of Hydropower Activity That Fluctuate Flows or Otherwise Cause Stranding. This section identifies types of fluctuations caused by hydropower activity.

Hydropower facilities cause flow fluctuations in a variety of ways. Successful mitigation requires a thorough understanding of hydropower operational practices and malfunctions than cause flow fluctuations. It is not sufficient to establish criteria specifying allowable hydraulic changes. Developers often fail to recognize or acknowledge all sources of flow fluctuations, and when facilities are built that fail to address all potential sources of flow fluctuations, they will typically resist unanticipated and often costly alterations of their facilities or the operation procedures. An overview of mechanical causes and suggested mechanical criteria and hydraulic criteria are provided.

The following bold scripted terms are defined:

Dam facilities have substantial water storage and a powerhouse at the base of the dam. **Run-of-the-river facilities** typically have a small **diversion dam** which diverts water into a **penstock**, a pipe that delivers water to the powerhouse, which is located farther down the river.

A hybrid of these two types of facilities is **dam and penstock facility** which has a powerhouse located some distance downstream of a large dam. Some types of operational impacts and mitigation activities apply only to certain types of facilities, thus it is important in understand these distinctions.

Other classification schemes many be helpful in identifying fluctuation concerns or mitigation actions. Does the facility have **seasonal storage**, **daily storage**, or **no storage**? How many turbines does it have? Many projects do not fit neatly into any classification scheme because of multiple purposes (irrigation or municipal diversions, recreation, flood control) or because of peculiarities in design or configuration. Thus, there is no single method for assessing fluctuation risks nor is the a single set of mitigation criteria that can be applied.

The **upstream reach** is the segment of the river above the diversion forebay or reservoir. The **bypass reach** is the segment of the river or stream between the diversion structure or dam and the powerhouse. Dam facilities do not have bypass reaches. The **downstream reach** is the segment of the river or stream below the powerhouse discharge.

The public often perceives run-of-the-river facilities as low impact alternatives to dam facilities because water is simply withdrawn from the bypass reach without altering the natural flow in the downstream reach. Run-of-the-river facilities do not normally change average daily flow or the thermal and chemical characteristics of a river or stream, and they do not normally inundate large amounts of land. However, they reduce average flows in the bypass reach, and they fluctuate flows in both the downstream and bypass reaches. This occurs because water passes through the penstock much faster than through the bypass reach. Thus drops in flow occur in the downstream reach every time the powerhouse discharge is shut off or suddenly reduced. When the discharge is started up, a drop in flow occurs in the bypass reach, <u>and</u> in the downstream reach. The flow in the downstream reach initially increases in response to the powerhouse discharge. However, it subsequently declines when the drop in flow originating from the diversion passes through the bypass reach to meet the powerhouse discharge (See Figure 5).

a. Peaking

Utilities often operate hydropower facilities to follow daily changes in power demand, a practice called **load following**. Power demand is higher during the day, especially in the morning and, to a lesser extent, in the evening. For many utilities, the capacity for load following is a premium power resource, and hydropower is the preferred means of load following. Thermal power plants, including coal, gas, oil, and nuclear facilities, wear down faster from the constant heating and cooling that results from load following, and usually operate less efficiently. Thus, hydropower facilities with seasonal or daily storage are often operated for load following (Carter and Trouille 1989).

When load following occurs, the powerhouse discharge fluctuates daily, an effect defined as **peaking**. Peaking is the most widely documented source of fish stranding. Biologists and fishermen have observed major fish kills from peaking (Thompson 1970; Graybill et al., 1979; Phinney 1974; Bauersfeld 1977, 1978; Becker et al., 1981). These fluctuations often occur daily for weeks or months resulting in severe cumulative impacts to fish populations. Whenever possible, a powerhouse located at the head of a free-flowing river should not be operated for peaking, especially during fry emergence and early stream residence. In a river with multiple dams, utilities can operate the upper dams for peaking, while discharge from the lowest dam remains constant (i.e., a **re-regulating reservoir**). Multiple dam systems suitable for load following and stable discharge are abundant in the Pacific Northwest. Utilities should use these opportunities to follow load demand.

When peaking is necessary, these discharges should be ramped down (Phinney 1974), and timed seasonally and/or daily, (Woodin 1984, Olson 1990). For all projects, biologists should identify a critical flow to minimize stranding.

b. Low Flow Shutdowns

Most projects have a minimum turbine flow below which it is impossible or impractical to operate the turbine(s) for power generation. In addition, a minimum flow is usually required to maintain the aquatic habitat in the bypass reach. For run-of-the- river facilities, power generation cannot occur unless river flow at the intake is greater than or equal to the combined bypass flow requirement and minimum turbine flow. These projects will have low flow shutdowns between 1 to 20 times a year depending on run-off patterns and bypass flow requirements. Dam facilities with seasonal storage can operate for years without a low flow shutdown.

c. Low Flow Start-ups

Run-of-the-river projects will cause a drop in flow in the bypass and downstream reaches during powerhouse start-ups (See Figure 5). In these situations, operators must ramp flows at the start of power generation to reduce stranding. Usually the ramping rates will be dictated by what is necessary to protect fish in the bypass reach. By the time the fluctuation reaches the downstream reach, attenuation from the powerhouse discharge, tributary inflow, and sometimes in-channel storage will usually moderate the ramping rate.

d. Powerhouse Failures

Powerhouse failures are disruptions of the penstock flow originating from the powerhouse. These disruptions result from powerhouse mechanical problems or **load rejection**, which is the inability of the utility line to receive power generated from the turbines. Load rejection requires immediate action to avoid damage to the turbine bearings and penstock, since the turbine will spin out of control without the resistance of the magnetic fields in the generator. Operators traditionally responded to powerhouse failures by cutting off penstock flow, which suddenly drops flow in the downstream reach. Biologists should expect powerhouse failures at any facility. My experience is that they occur most frequently at small, run-of-the-river facilities with a single turbine, remote control operation, and a long rural utility line.

Flow continuation is the mechanical capacity to maintain flow through the penstock during powerhouse failures. Flow continuation is now a standard design criteria for new run-of-the-river facilities in Washington State. Flow continuation can be provided by a flow bypass valve which allows flow to pass around the turbine when in operation. Pelton turbines can be designed with deflectors to safely pass flow through the turbine without generating power. Pelton deflectors might serve as a substitute for a flow bypass valve, although further evaluation is needed. With flow continuation equipment, power generation can be shut off and on without ramping flow up or down, a feature that will appeal to some utilities. Flow continuation can also reduce human safety risks associated with rapid increases in flow.

The flow continuation equipment, especially bypass valves, are expensive, and developers may try to install equipment that cannot provide sustained flow continuation. Fishery agencies should specify the duration of flow continuation as part of the design criteria. It may be appropriate to waiver flow continuation requirements when river flow is >10 percent of the annual flow exceedence. During very high flows, suspended fines can wear or damage equipment, and flow continuation probably offers little benefit to aquatic life.

If maintenance or repair activity absolutely requires the penstock flow to be shut off, the operator can ramp the discharge immediately. Since flow disruption is inevitable, there is no benefit from flow continuation. Likewise, if the operator knows that power generation will be shut down for several days, ramping can start immediately. There is no purpose in subjecting the flow continuation equipment to unnecessary wear, and in some cases, fish and aquatic life in the bypass reach will benefit from sustained higher flows.

e. Intake Failures

Intake failures cover all penstock flow disruptions that occur at the intake structure. This may result from the accumulation of debris, the failure of fish screen cleaning equipment, or failure of the dam and associated gates to divert water into the intake. My experience to date suggests that intake failures are less frequent than powerhouse failures. Many intake failures result from a gradual accumulation of debris on the screens and trash racks and tend to ramp down slowly until the minimum operating flow is reached. When an intake failure occurs, flow continuation is impossible except at dam facilities with multiple intake and discharge locations. Furthermore, the capacity to ramp flows after intake failures may be limited. Therefore, prevention is the preferred means of reducing intake failures. The diversion structure should be designed and maintained to minimize intake failures. Design criteria for mechanical screen cleaning and trash control equipment should be considered.

When an intake failure occurs, operators should attempt to ramp with the residual water in the penstock, although meeting ramping rate criteria established for powerhouse failures is often impossible.

Intake failures are most likely to occur during the first one or two high flow events of the fall. These initial high flows pick-up leaf litter and other debris that have accumulated in the stream channel over the summer and early fall. This debris frequently overloads the debris control equipment (pers. comm. with several small hydro operators). More frequent maintenance is normally required at this time. One run-of-the-river facility in Washington State addresses this problem by foregoing power generation until after the first one or two major storms.

f. Cycling

For a run-of-the-river facility, the minimum river flow needed for power generation is the sum of the minimum bypass flow requirement and the minimum turbine flow. When the river flow is less than this sum but greater than the minimum bypass flow requirement, it is possible to continue operation intermittently by using the reservoir, surge tank, and/or penstock for storage. The operator stores water in excess of the minimum bypass flow. When the storage is full, power can be generated for a short time. This practice fluctuates flow in the downstream reach many times a day.

Cycling is simply a way to generate power when flow is not enough for continuous or efficient operation, and it is not an attempt to follow load demand. Cycling may also occur as a result of an improperly programmed automated powerhouse which shuts off and on near minimum operation flows. An example of cycling is shown in Figure 6.

The biological impacts of flow fluctuations have not been formally evaluated. However, cycling is likely the most damaging type of hydropower flow fluctuation, especially when compared to the negligible amount of power generated. Cycling will normally occur at low stream flows when the salmonids would be most vulnerable to fluctuations. Fish habitat will be most limited at low flow, and the effect on fish populations is probably severe. Massive stranding of emerging fry is likely during parts of the year. Cycling would probably reduce primary and secondary productivity substantially. Until research can conclusively demonstrate that cycling is not harmful, cycling should be forbidden. If a developer is concerned with utilizing sub-operational flows, a smaller auxiliary turbine can be installed.

g. Multiple Turbine Operation

If a powerhouse has two or more turbines, operators can cause abrupt changes in flow when changing the number of turbines in operation. Biologists should specify for a smooth transition of flow when the number of turbines are reduced. Most modern turbines are designed to operate over a broad range of flows; thus, a smooth transition is relatively easy to accomplish. **Modified peaking and modified cycling** occur when power generation is switched off and on for some turbines but one or more turbines are running continuously. These operations will not have the impact of a single turbine shutting off and on. However, biological impacts should be expected in most cases. Modified cycling should be discouraged.

h. Forebay Surges

The hydrographs from a new run-of-the-river project indicated a surge of water every time the powerhouse started generation (Figure 6). This was probably caused by a drop in head at the intake during start-up. These forebay surges were relatively insignificant during medium or high flows but appeared to cause severe fluctuations at low flows. The prevalence of this problem among hydropower facilities is unknown. However, facilities should be designed and operated to avoid forebay surges.

i. Reservoir Stranding

Hydropower activity can cause stranding in forebays and reservoirs. The author has observed stranding of a rainbow trout in a very small forebay at a run-of-the-river facility. The forebay water level was fluctuating as a result of cycling.

Reservoir or forebay maintenance drawdowns sometimes cause stranding. In large reservoirs, stranding is routinely anticipated as one of the consequences of drawdowns, and it is sometimes employed as a method of eradicating undesirable fish. However, stranding also occurs in the forebays of run-of-the-river projects. In one case, the author observed a run-of-the-river project with a narrow forebay of about one quarter acre which was drawn down for annual maintenance. Despite an active stream flowing through the forebay and through a gate in the dam, about 30 juvenile and adult trout were trapped in a shallow, concrete depression in front of the intake trash rack. The operator agreed to electroshock and move these fish back to the stream as part of every maintenance shutdown. Intake structures should be designed to drain completely without leaving pools of water.

j. Tailwater Maintenance and Repair Activities

All hydropower facilities will eventually require inspections, maintenance, and repair. For most facilities, these activities occur during low flow periods or during operational shutdowns without disrupting flow. However, if a dam facility has only one discharge site or tailrace, it is often impossible to inspect or repair the structure or equipment submerged in the tailwater without completely or substantially disrupting the flow of the river. Phillips (1969) describes a severe fluctuation resulting from a tailwater inspection. Ideally, dam facilities should have multiple points of discharge to avoid these infrequent but severe impacts.

k. Frequency of Fluctuations at Run-of-the-River Facilities

Run-of-the-river facilities can cause flow fluctuations as a result of low flow shutdowns, start-ups, powerhouse failures, intake failures, cycling, and forebay surging. From the limited data available to the author, the frequency and type of flow fluctuations are quite variable. Many new or proposed run-of-the-river facilities are located in remote mountainous areas, serviced by rural utility lines, and operated by remote control. At one new single turbine run-of-the-river facility (Weeks Falls project on the SF Snoqualmie River), approximately 150 powerhouse shutdowns were recorded during the first 23 months of operation, including 46 during sensitive low-flow periods (Figures 6 and 7). After four years of operation, it was still experiencing a high frequency shutdowns. However older, utility-owned, run-of-the-river facilities often have a relatively low frequency of shutdowns. Facilities, such as the Yelm Project on the Nisqually River and Snoqualmie Falls Project on the Snoqualmie River, are managed for steady base load power production. The operators of these facilities have a vested interest in maintaining stable power production and have had many years to mechanically resolve the causes of shutdowns. Frequency of shutdowns is probably less than five per year, although the author has not been able to acquire actual data from these utilities.

7. Mitigation Requirements and Considerations

Mitigation negotiations require a timely development of information and, in response to this information, terms and conditions for construction, further evaluation, and operation. This section provides an example on how and when to address the issues and develop criteria.

Washington Department of Fisheries (WDF) requires full mitigation for all fish kills and all losses of anadromous fish habitat (i.e., no net loss). Owners of existing facilities up for relicensing must make all reasonable attempts to avoid harm to anadromous fish and correct facility activities or features that are currently causing habitat losses. If salmon production cannot be restored to preproject levels, alternative mitigation, either in the form of off-site enhancement, or hatchery production, will be requested. Proposed new facilities must demonstrate that no impact on the salmon resource will occur before WDF supports construction. If there is any doubt as to whether certain operation procedures and/or facility designs are harmful to fish, the burden of proof is on the developer or utility to study the potential impact and demonstrate that no harm will occur.

These relatively high standards of mitigation are a policy response to the high value the public places on the anadromous fish resource, and the historical and ongoing losses of fish and fish habitat as a result of hydropower development. In addition, the Indian treaty fishing rights implicitly includes preservation of the freshwater habitat needed by wild salmonids. Current policy precludes new hydropower development in a river reach accessible to anadromous fish. Resource agencies in other areas may need to interpret the criteria presented below in light of their own policies. Furthermore, criteria should be modified to protect local species which may have different life cycles, behaviors, and periods of vulnerability.

Mitigation activities for flow fluctuations continue throughout the development of a project, including consultation, licensing and operations. The following discussion parallels the U.S. Federal Energy Regulatory Commission's licensing procedures. In general, mitigation criteria for rivers are well established. However, more research is needed to fully understand the impact of flow fluctuations on streams (i.e., average annual flows less than 500 cfs), and at this time, WDF does not have a clearly defined set of criteria to apply to smaller projects. Criteria for these smaller projects will be influenced by site specific observations and future research.

a. Consultation

During consultation, the agencies identify concerns and informational needs, and the applicant collects information and performs studies as requested.

The applicant should identify the fish species present and locate the barriers to anadromous fish passage. This information will give biologists a rough idea of which impacts may occur. Pre-project information on flow, species composition, and fish also serve as a baseline to compare against post-construction information. A life history schedule of the important fish species should be developed to determine time periods when stranding or redd dewatering are likely to occur.

i. Under most circumstances, permanent ramping rate criteria can be established for projects located on rivers, as listed below. These criteria also serve as interim ramping rate criteria for facilities located on streams:

Season	Daylight Rates[3]	Night Rates
February 16 to June 15[1]	No Ramping	2 inches/hour
June 16 to October 31[2]	1 inch/hour	1 inch/hour
November 1 to February 15	2 inches/hour	2 inches/hour

1 Salmon fry are present
2 Steelhead fry are present
3 Daylight is defined as one hour before sunrise to one hour after sunset

ii. The applicant should collect information for a rating table at the most confined (i.e., narrowest) river transect immediately downstream of the source of the flow fluctuations (ie., powerhouse, and for run-of-the-river projects, diversion dam). For some projects, this transect will be located close to the tailrace of the project. The location of this transect must be approved by agency biologists. This transect becomes the control point for measuring the ramp rate.

iii. If the applicant wants to peak flow discharges to follow load demand, he should demonstrate that the load following capacity is needed and not available elsewhere. The applicant should indicate the times of the year this peaking is anticipated and consult with the agencies on the biological impacts and potential mitigative actions. However, in productive river systems, peaking may simply be an unacceptable mode of operation. Currently, WDF opposes peaking operations at proposed facilities with free-flowing downstream reaches accessible to salmon.

b. Licensing

During licensing, biologists should specify terms and conditions that minimize the occurrence of fluctuations. When fluctuations are unavoidable, they should specify terms and conditions that establish ramping rates and ramping schedules that permit a smooth transition in flow. Some or all of the following terms and conditions can be applied to achieve these objectives.

i. All proposed run-of-the-river facilities should have the mechanical capacity to maintain flow continuation for 48 hours. When a powerhouse failure occurs, flow continuation should be maintained a minimum of 24 hours. During salmon fry emergence, flow continuation should continue beyond 24 to avoid ramping during daylight hours. This additional time should also take into account the lag time it takes for the fluctuation to reach sensitive downstream rearing habitats. Under most circumstances, more lenient flow continuation criteria can be specified at high flows (i.e., above the 10 percent annual flow exceedence).

Dam facilities should have the capacity for indefinite flow continuation. A value should be installed in the dam to permit flow discharges independent of the turbines.

ii. Proposed facilities shall have the designed capacity to down ramp the powerhouse discharge at 1 inch of stage per hour at the transect approved by agency biologists during consultation. For run-of-the-river projects, the diversion and intake structure should have the capacity to ramp bypass flows at 1 inch per hour. If necessary, existing facilities should upgrade their equipment to meet the 1 inch per hour ramp capacity.

iii. Agency biologists will assist the applicant in determining the critical flow, in other words, the flow above which the risks of stranding are negligible. This may best be determined by observing the key stranding areas at different flows.

iv. For existing dam and penstock facilities without flow continuation equipment, operators can offset fluctuations in the downstream reach by increasing the bypass flow prior to a powerhouse shutdown. Once the higher bypass flow reaches the powerhouse, the powerhouse can ramp down at a relatively fast rate. Obviously, fluctuations from unanticipated powerhouse shutdowns cannot be prevented with this method.

v. In the event of an intake failure at a run-of-the- river facility, the powerhouse should be operated to ramp flows down as smoothly as possible using residual water in the penstock and surge tank. Intake fish screens shall be cleaned and maintained as often as necessary to prevent intake failures. Under most circumstances, mechanical cleaning equipment should be required.

vi. Cycling is forbidden.

vii. Applicants should design and operate projects to avoid forebay surges.

viii. If peaking is permitted, the resource agencies shall determine seasonal and daily limitations on this mode of operation.

c. **Operations**

i. The operation manual shall explicitly list the operation procedures needed for flow continuation, ramping and maintaining the intake screens. Critical flows must be identified.

ii. Utilities should operate large storage facilities to avoid redd desiccation in spawning areas below dams. Flow discharges during spawning should be kept relatively stable, but not so low that the migration and spawning activity are impeded and not so high that water storage is reduced and there is risk of redd dewatering during incubation.

Biologists and utilities often have difficulty identifying a fixed operating procedure, especially when the utility has to manage flow releases for other objectives, such as summer reservoir recreation (i.e., keep reservoir pool high and stable), winter flood control (i.e., draw reservoir pool down), and power demand. Since most stocks of salmon spawn just before or during the heavy rain season (late fall to early winter), the desirable strategy is to increase flows during the spawning season only when necessary to meet flood control requirements <u>and avoid reducing flows</u>. When spawning is complete, excess water is released if necessary, and a minimum incubation flow is established. This strategy maintains greater flow flexibility during incubation and emergence. Under some circumstances, a written operation plan that takes into account all possible hydrologic scenarios can be developed. However, sometimes in-season communications between biologists and operators provide the best means of protecting redds.

iii. For projects located on streams, the permanent ramping rates may be established after construction on the basis of site-specific observations and any new research on the impact in streams.

8. Field Methods. This section contains notes and references concerning field methods.

a. A Word of Caution.

Investigators should carefully consider whether flow fluctuation events staged to evaluate ramping or stranding are necessary, especially when fish kills are anticipated. A number of the author's professional predecessors have observed that the souls of these dead fish come back to haunt you in the form of irate fishermen and agency administrators, especially when the news media reports the event. In one test, researchers abruptly canceled an experiment and restored initial flows when 'tens of thousands' of stranded juvenile salmon were observed during the initial drop in flow (Hamilton and Buell 1976). Whenever possible, researchers should try to assess impacts that occur from routine hydropower operations, rather than staging events of larger magnitude. If you are only testing the hydraulic response, select a time of the year when salmonid fry are least vulnerable.

b. Estimation of Stranding Losses

Direct counts of stranded fish as a result of flow fluctuations may be useful as indices. However, researchers have had difficulty making reliable and unbiased estimates of total mortality. A complete survey of a river system during a fluctuation event requires a very large group of observers. Many stranded juvenile fish, especially fry, are hidden in the substrate where they seek refuge during declining flows. Out-of-sight salmonid stranding occurs in gravel (Phinney 1974, Bauersfeld 1978), mud (Becker et al., 1981), and vegetation (Phillips 1969, Satterthwaite 1987). Under laboratory conditions which permitted total enumeration of test fish, Monk (1989) counted surface and subsurface stranding on three types of gravel substrate. The ratios of surface to subsurface stranding on fine gravel, medium gravel and cobbles was 1:0.01, 1:1.5 and 1:1.0 respectively for chinook fry (mean fork length 46.5 mm), and 1:0.06, 1:5.6 and 1:2.9 respectively for steelhead fry (mean fork length 33 mm).

Scavengers and predators often remove fish before observers can count them. Crows often start foraging as soon as flows decline (Phinney 1974, Fiscus 1977, Satterthwaite 1987, author's pers. obs.). Other animals, ranging from slugs to humans, have been observed taking stranded fish. Both Phinney (1979) and Bauersfeld (1978) tried to establish habitat index areas for stranding observations. Counts were expanded to estimate losses in similar habitat exposed by the fluctuation event. They found it difficult to count stranding within limited index areas. In addition, they had trouble estimating the total area exposed from aerial photographs because of shadows casted by trees and high banks. As a result, tenuous assumptions were necessary in deriving estimates of total mortality. Other studies simply abandoned attempts to estimate losses (Phillips 1969, Phinney et al., 1973, Becker et al., 1981) or did not attempt to estimate losses. Future estimation of stranding losses should be approached with cautious methodology and realistic expectations.

c. Ramping Rate Tests

Under some circumstances, it is necessary to evaluate the hydraulic response to a change in flow over an extended area downstream of the fluctuation source. If possible, testing should occur in the fall prior to spawning. At this time salmon have grown substantially, although steelhead fry are still rather vulnerable. Prior to testing, the utility and resource agencies should meet and agree on the number of tests to be performed, number and location of observation sites, and date and time to perform them. Multiple tests may be necessary to evaluate several different flows or to repeat earlier tests that were unsatisfactory.

The utility should install a staff gage at each station prior to the test. All observers should be stationed on-site at the start of ramping. Staff gage readings should be recorded at predetermined time intervals, typically every 5 to 10 minutes. If biological observations are desired, a second person can observe the amount of exposed river bed, type of substrate exposed, and observe stranding directly.

9. Discussion

a. Flow Alterations and Flow Fluctuations

Current assessment of the effects of hydropower development on riverine fish production is usually focused on flow alterations, using the IFIM methodology as the primary analytical tool. For examples, comprehensive fishery studies of small run-of-the-river hydropower development in Montana (Leathe and Enk 1985) and Oregon (Kelly 1980; WRRI 1982) estimated the habitat effect of flow reductions in the bypass reaches using IFIM methodology, but not the impacts of flow fluctuations in the bypass and downstream reaches. A hydropower trade journal report on methods of balancing load following with fish and recreational needs (Carter and Trouille 1989), relied exclusively on the IFIM methodology and failed to consider lethal and behavioral impacts of flow fluctuations. A comprehensive review of environmental mitigation at hydropower projects (Sale et al., 1991) addressed in considerably detail the variety of instream flow requirements negotiated at hydropower projects; however, the issue of flow fluctuations was limited to one brief sentence. Site-specific studies that give a balanced treatment of the effects of both flow alterations and flow fluctuations, such as Hamilton and Buell (1976), are relatively rare.

The IFIM methodology is a valuable and widely accepted procedure for measuring change in fish habitat and has legitimate application to situations involving flow alterations. However, it is a complex and engrossing methodology that often distracts from other biological effects of hydropower development.

Are the impacts of flow fluctuations more significant than flow alterations? I don't believe there is an answer to this question. The magnitude of each impact is a site-specific function of species, channel size, channel morphology, and facility operations. Furthermore, these impacts are measured in different units (i.e., stranding mortality versus usable habitat area). However, it should be emphasized that lethal effects of flow fluctuations on salmonids are widely documented in the Pacific Northwest. By contrast, experimental verification of the relationship between habitat units and salmonid productivity is sparse.

Recent enhancements of the IFIM methodology are showing increasing ability to address the effects of flow fluctuations. Prewitt and Whitmus (1986) propose some methods for assessing relative stranding risks resulting from different changes in flow. These methods might be useful when the relative risks of different operational procedures must be compared. Nestler et al. (1989) describe a method for assessing the habitat effect of peaking on fish that are capable of moving to suitable habitat. Thuemler et al. (1991) added a method of measuring the loss of habitat for immobile aquatic animals as a result of peaking discharges.

However, the IFIM methods have not been developed to the point where it can be a primary tool for assessing flow fluctuations. The biological response, including lethal effects, delayed effects, and behavioral effects are not sufficently understood to permit reliable modelling. When there is a "no net loss" objective, a complex study is unnecessary. Ramping rates, ramping schedules, and critical flows can often be determined by biologists from the hydraulic, hydrological and biological characteristics of the tributary and from comparable studies.

b. Needs for Additional Research

In Washington State, the current flow fluctuation mitigation criteria are based on research in medium and large rivers. Most new hydropower facilities built in the next decade will be small run-of-the-river facilities located on streams (<500 cfs average annual flow). Research is needed to develop criteria for small rivers and streams to protect the species that prefer these habitat (coho, steelhead, and resident trout). The behavioral effects of fluctuations on juvenile salmonids requires further study, especially as they apply to small streams.

A study by Gilsason (1985) and other studies reviewed by Cushman (1985) suggest that the impact of peaking in Washington State rivers is underestimated because of impacts to the aquatic invertebrate community. Research is needed to better measure this impact, and also identify the relationship between invertebrate production and salmonid production.

Current methods for estimating stranding losses are inadequate to accurately assess loss of production. Development of alternative methods would be helpful.

c. Does stranding occur only in the Pacific Northwest?

As far as I could determine, all published observations, except one (Hvisten 1985) on salmonid stranding comes from studies and observations in Washington, Oregon, and British Columbia. In this region, numerous hydropower developments have occurred in rivers historically utilized by large populations of anadromous salmonids. To further enhance the likelihood of observations, steelhead sport fishermen are typically on the rivers when salmon fry are emerging, and they have reported many stranding episodes to fishery agencies. Nevertheless, I was surprised by the lack of information on stranding from other regions.

d. Resident Trout Stranding

I found only one published account of resident trout stranding (Hvisten 1985). Nevertheless, I have personally observed resident trout stranding on two occasions. Resident trout stranding is less likely to be reported simply because most resident fish populations are limited by adult rearing habitat, and thus, there are fewer juveniles. By contrast, the production potential of adult anadromous salmonids is relatively unrestricted by the river habitat.

Anadromous adults much more numerous and more fecund, and thus produce a much greater density of juveniles. Obviously, observers are far more likely to report the stranding of large numbers of juveniles than small numbers.

It is possible that limited fry stranding will have little effect on resident populations because production is limited by the adult rearing habitat and, thus, juvenile to adult survival is not a major limiting factor.

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Exhibit F

RUSSIAN RIVER BIOLOGICAL ASSESSMENT INTERIM REPORT 1 - FLOOD CONTROL OPERATIONS AT COYOTE VALLEY AND WARM SPRINGS DAMS

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EXHIBIT F

Table 2-23 Channel Maintenance Flow Associated with the 1.5-Year Peak Discharge and 1.5-Year One-Day Discharge

	1.5-Year Peak Discharge	1.5-Year One-Day Discharge
Dry Creek below Warm Springs Dam	9,500	5,000
Dry Creek near Geyserville	11,000	7,000
Russian River at Hopland	14,500	9,500
Russian River at Cloverdale	18,000	14,000
Russian River at Healdsburg	25,000	21,000

Note: 1.5 Year unregulated flow for peak and one-day discharge from USACE flood frequency curves.

Scoring criteria are shown in Table 2-24. A single score is given for the entire period of record (water years 1960 to 1995), since any single year alone does not encompass a sufficiently long time period to assess if flood control operations are adequate to maintain channel geomorphic conditions. By definition, the channel-forming flow should occur about twice out of every three years, as a long-term average. When the channel forming flow occurs less frequently, lower scores are applied. If the maximum annual discharge never meets or exceeds the threshold for the natural channel forming flow, the score is 0. Channel forming flows that occur more frequently received correspondingly higher scores (see Table 2-24). The scoring applies equally to steelhead, coho, and chinook salmon.

Table 2-24 Scoring Criteria for Maintenance of Channel Geomorphic Conditions

Annual Flood Exceedance Frequency	Number of Years per 36-Year Period of Record[a]	Score
51%-66%	19-24	5
36%-50%	14-18	4
21%-35%	8-13	3
11%-20%	5-7	2
1%-10%	4 or less	1
0%	0	0

[a] Multiple channel forming flows that may occur in a single year are counted as one occurrence for that year.

2.5 FISH STRANDING: RAMPING RATES

2.5.1 ISSUES OF CONCERN

To protect spawning gravel and juvenile salmonids within the Russian River and Dry Creek during flood control operations, USACE, in consultation with NMFS and CDFG, has developed interim guidelines for flow release changes, summarized as follows:

Reservoir OutFlow	Ramping Rate
0-250 cfs	125 cfs/hour
250-1,000 cfs	250 cfs/hour
>1,000 cfs	1,000 cfs/hour

The maximum ramping rates at release levels below 1,000 cfs differ from authorized rates, however, every effort is made to comply with the interim rates (USACE, 1998a,b). These ramping rates are intended for flood control activities only. Flow changes above 1,000-cfs release are generally limited to a rate of 1,000 cfs/hr to protect against bank sloughing and are not related to fish stranding issues. Lower ramping rates at lower reservoir flow releases are to protect against fish stranding. The ramping rate guidelines are followed for flood operations that ramp flows down as well as releases that ramp flows up (Bond, USACE, pers. comm.).

In addition to ramping during flood control operations, change in flow releases from Warm Springs and Coyote Valley Dams are scheduled annually for dam maintenance and inspection activities. In order to perform the annual and periodic dam inspection and maintenance work, ramping down flow releases is necessary for conduit inspections. Ramping rates during dam inspection and maintenance have in recent years been determined by consultation between USACE and NMFS prior to each year's annual inspection. Ramping rates related to dam maintenance and pre-flood inspection activities are separately discussed and evaluated in Section 2.6.

In addition to regular pre-flood inspection and maintenance activities, both dams have historically required infrequent but important testing of the outlet works to verify safe operation of the projects. Testing may include investigations to determine damages, identify the cause of damages, verify the reliability of outlet works and changes in Standard Operating Procedures to insure the continued operational integrity of the project. The flow releases necessary for testing are not the same as those required for pre-flood inspection and maintenance activities. Testing flow releases are variable, and the need to conduct testing may arise at anytime throughout the year. An example of dam safety testing was the vibration analysis conducted in January, February and March 1998 at Warm Springs Dam, where outflow varied between 50 cfs and 3,000 cfs. This testing was performed to investigate the reliability of the outlet works and to insure the continued safe operation of the dam.

Recent research in Washington indicates that natural flow recessions associated with the annual snowmelt hydrograph occur at a very slow rate and tends to reduce the likelihood of stranding of small salmonids (Hunter 1992). If discharge is decreased too rapidly by flow regulation, then juvenile, or even adult salmon, can be stranded and killed.

Juveniles, and particularly fry, are more susceptible to stranding than adults. Once chinook salmon grow to 50-60 mm or steelhead grow to 40 mm, they are substantially less vulnerable, but adult stranding has also been documented (Hunter 1992). Fry that have just absorbed the yolk sac and have recently emerged from the gravel are the most vulnerable because they are poor swimmers and typically reside along shallow stream margins (Phinney 1974, Woodin 1984). Stranding of juvenile coho and rainbow trout on a gravel substrate in an artificial stream at low temperature was less frequent at slow rates of dewatering (6 cm/hr stage change rather than 30 cm/hr) and if flow reductions occurred at night (Bradford, *et al.* 1995). Stranding of juvenile coho was reduced when the slope of the bar exceeded 6%.

The behavioral response of fish to flow fluctuations and how it may cause downstream emigration is not well understood. Studies conducted during the early 1970's by McPhee and Brusven (1976, cited in Hunter 1992) demonstrate that streamflow fluctuations trigger benthic drift and cause juvenile salmon to migrate downstream. Streamflow fluctuations can also cause both juvenile and adult fish to become trapped in shallow areas which are then exposed to elevated temperature or predation.

Redds are also susceptible to lowering water levels. Salmonid eggs can survive for weeks in dewatered gravel if they remain moist and are not frozen or subjected to high temperatures. However, dewatering is lethal to alevins (yolk sac fry that hatch from the eggs and live for a brief period within the interstitial spaces of the streambed gravels). Since salmonids spawn over a period of months, eggs and alevins are often present at the same time.

Ramping rates typically constrain the rate (cfs/hr) at which a controlled release can be changed. Ramping rates are important to fisheries management agencies because they affect the rate at which instream hydraulic, and therefore habitat conditions, can be changed. The rate at which a controlled release is changed affects the rate at which total streamflow and downstream flow depths, flow velocities, channel top widths, and wetted surface areas change. The degree to which a particular ramping rate affects instream hydraulic and habitat conditions depends upon several site-specific factors:

- the percentage of total streamflow affected by the ramped release
- the amount of streamflow during ramping
- stream channel shape, cross-sectional area, and slope
- downstream distance from the ramping location

Perhaps the most difficult factor to understand quantitatively is the degree to which a flow change is "attenuated" as it progresses downstream. The influence of a sudden change in flow on stage is most pronounced at the location where the change occurs and decreases rapidly in the downstream direction. If a controlled release is ramped up, a portion of the released water goes into channel storage rather than directly into streamflow. Channel storage is represented by that portion of the channel cross-section over which the increased flow is spread, or temporarily "stored" along the channel length. This reduces the amount of flow and moderates the resulting change in water surface elevation (stage) observed downstream from the point of ramping. If the controlled release is ramped down, a portion of channel storage is "evacuated" to become streamflow. The rate and degree to which channel storage changes influence stage primarily depends upon the size of the flow change (ramping) relative to streamflow and channel size, cross-sectional area, channel shape, and slope. Tributary inflow is also important. As tributary inflow contributes to streamflow in the channel, the relative effect of ramping represents a proportionally smaller influence on total channel flow and associated change in stage. For this analysis of ramping rates on Dry Creek, attenuation is assumed to occur within 1 to 1.5 miles downstream of Warm Springs Dam which is the location of the first major tributary input at Pena Creek. On the mainstem Russian River, ramping effects are assumed to be attenuated by about 5 miles or less downstream of Coyote Dam near the Perkins Street bridge crossing in Ukiah. At the Forks, there is usually considerable flow from the mainstem Russian River during flood control operations that would attenuate ramping effects. Flows of about 2,500 cfs on the mainstem Russian River influence backwater effects on the East Fork (Pugner, USACE, pers. comm.). Flow in the mainstem Russian River is usually increasing as reservoir releases are being reduced during flood control operations, which moderates the ramping effects.

It is unlikely that ramping up rates associated with flood control operations would have an effect on listed species. Dam releases during flood control operations are made when downstream tributary flows are receding after a storm event, thereby reducing rather than augmenting natural flood peaks. Ramping up rates follow the interim guidelines, so that when release flows are above 1,000 cfs, ramping occurs at no more than 1,000 cfs/hr. This ramping rate is lower than natural flow increases associated with storm events. The USGS gage at Ukiah (11461000) located above the Forks was inspected and evaluated for natural flow changes for the period November 1995 to June 1999. Flows at the Ukiah gage are not regulated, and therefore represent natural flow fluctuations. On the rising limb of the storm hydrograph, hourly increases in flows above 1,500 cfs average 390 cfs/hr, and 10% of the time (90^{th} percentile) exceed 960 cfs/hr. A storm hydrograph for January 20-24, 1997 is shown in Figure 2-1. From USGS stage data for this station, the maximum stage change associated with the rising limb of this storm event is approximately 1.9 ft/hr. The stage change associated with the average 390 cfs/hr increase in flows is approximately 0.5 ft (when flows are greater than 1,000 cfs). These data indicate that natural stage changes are sometimes greater than the Hunter criteria.

2.5.2 RAMPING RATE EVALUATION CRITERIA

The Washington Department of Fisheries has proposed a rate of stage change that will generally protect fish (Hunter 1992). Hunter's ramping guidelines are modified with the phenology of salmonids in the Russian River for this assessment (Table 2-25).

Table 2-25 Rates of Stage Change Based upon Hunter (1992) and Life History Stages for Salmon and Steelhead in the Russian River

Season	Rates
March 1 to July 1	1 inch/hour
June 1 to November 1	2 inches/hour

Drawing from Hunter's proposed guidelines, during juvenile rearing periods, which occur year-round for steelhead and coho salmon in the Russian River, 2 inch/hour (0.16 ft/hr) stage change is appropriate. In the Mirabel Rubber Dam Fish Sampling Program (Chase 2000), chinook smolts have been caught in a rotary screw trap at the Mirabel Rubber Dam in April, May and June, of 1999 and 2000, suggesting that chinook do rear in the Russian River watershed. Insufficient data are available to say where rearing occurs.

The Hunter (1992) guidelines are considered to represent a rigorous and conservative ramping standard for the Russian River. Hunter developed his guidelines based on streams located in the northwest, a hydrologic regime that is dominated by snowmelt processes. Snowmelt streams usually have relatively gradual changes in runoff conditions. In the Russian River drainage, streamflow is driven by often intense Pacific frontal storms that naturally result in very "flashy" runoff conditions and therefore relatively larger changes in stage compared with snowmelt runoff conditions.

By comparison to the Hunter guidelines, stage changes associated with the receding limb of storm events were reviewed for the USGS Ukiah gage (11461000) located above the Forks. For the period November 1995-June 1999, the average stage change is approximately 0.3 to 0.4 ft/hr when flows are greater than 1,500 cfs. At the 90th percentile, stage changes range from 0.4 to 0.5 ft/hr or more when flows are greater than 1,500 cfs. Thus, the Hunter guidelines are considered to present a high standard for ramping.

2.5.2.1 Ramping Release Rate 1,000-250 cfs

Ramping may occur at higher or lower streamflow conditions during the winter and spring runoff periods as part of flood control operations. When the reservoir release is between 1,000-250 cfs, the interim guideline for the ramping rate is 250 cfs/hr.

Evaluation criteria and scoring for ramping in the 1,000-250 cfs flow range (Table 2-26) are based on Hunter's (1992) guidelines and the interim ramping rates established by USACE in consultation with NMFS and CDFG. The highest score is given if stage changes meet Hunter's (1992) guidelines, 0.16 ft/hr during periods when juveniles are present. Ramping that exceeds Hunter's (1992) guidelines by up to 100%, receive a score of 4. Ramping activities that exceed Hunter's guidelines by more than 100% but do meet the established interim ramping rate (250 cfs/hr), receive a score of 3. Ramping rates that exceed the interim flow criteria by up to 50% (i.e., up to 375 cfs/hr) receive a score of 2, and if ramping rates exceed the interim flow criteria by more than 50% (greater than 375 cfs/hr), the score is 1.

Table 2-26 Ramping Evaluation Criteria for Streamflows 1,000 cfs-250 cfs

Criteria	Score
Meet 0.16 ft Maximum Stage Change	5
Within 100% of 0.16 ft Criteria (0.32 ft) for Stage Change	4
Meets Interim Ramping Criteria (250 cfs/hr)	3
Exceeds Interim Ramping Criteria up to 50% (375 cfs/hr)	2
Exceeds Interim Ramping Criteria by Greater than 50% (>375 cfs/hr)	1

In order to determine if the ramping rates meet, or the extent to which they exceed the criteria in Table 2-26, stage-discharge relationships were obtained from HEC-RAS modeling for the appropriate cross-sections. The HEC-RAS model provides information on the change in stage (depth) associated with a change in discharge. The model itself does not account for the effects of attenuation of releases by flow contributions from downstream tributaries or accretion in baseflow. Therefore, the HEC-RAS model may overestimate changes in stage for progressively downstream cross-sections. Pools, side-channels and gravel bars attenuate the ramping rate by storing water from higher flows and releasing the water gradually. The largest actual changes in stage are expected closest to the dam.

On Dry Creek, the ramping evaluation includes a 1.5-mile long reach below Warm Springs Dam (see discussion under section 2.5.1). Ten cross-sections (103 to 112) were used in the assessment. On the mainstem Russian River, four cross-sections (48, 48.1, 49, 49.1) closest to Coyote Valley Dam, from about 3 miles to 5 miles downstream of the dam, were used. There

Exhibit G

Date: Tue, 31 May 2011 15:55:03 -0700
From: David Hines <David.Hines@noaa.gov>
Subject: Re: Hopland report

To: Sean White <rrfc@saber.net>

Sean,

The answer to each of your questions is basically the same: Since there were no data on those variables of interest, we used our best professional judgment to reasonably and conservatively define them. These were clearly stated as assumptions in the report.

David

On 5/18/2011 4:35 PM, Sean White wrote:
> David:
>
> I am interested in the supporting basis for some of the multipliers
> used to derive 25,872. Based on the information I received from my
> FOIA request, it appears that the only actual data for this
> calculation is Tom's single observation of 10 fish.
>
> If that is the case:
>
> How did you determine the relevant impacts of other (severity index)
> with out validation of the relationship?
>
> How did you determine that the fish density of 10 fish in 100 feet was
> representative of all 28 miles?
>
> How did you determine that the percentage of stranding habitat was 25%
> of the 100 feet? There was no ratio or percentage in Tom's note.
>
> How did you determine that this percentage was representative of all
> 28 miles?
>
> Sorry to be a pain in the neck but 10 to 25k is quite a leap, trying
> to get a feel for how you got there.
>
> Sean
>
> On 5/11/2011 3:06 PM, David Hines wrote:
>> Sean,
>>
>> I am the primary author of the report. But, I collaborated with
>> others in the office and it went through multiple levels of review
>> and was approved by Jane Lubchenco, Under Secretary of Commerce for
>> Oceans and Atmosphere. Send me your questions on the calculations
>> and I will answer them when I can.
>>
>> David
>>
>> On 5/9/2011 4:01 PM, Sean White wrote:
>>> David:
>>>
>>> I finally got a copy of the March report. Who wrote this? I would
>>> like clarification in some of the factors in the calculation.
>>>
>>> Sean
>>

EXHIBIT G

Exhibit H

Wagner&Bonsignore
Consulting Civil Engineers, A Corporation

Nicholas F. Bonsignore, P.E.
Robert C. Wagner, P.E.
Paula J. Whealen
Henry S. Matsunaga

Brad E. Newton, Ph.D., P.G.
John Faux, P.E.
David Houston, P.E.
David P. Lounsbury, P.E.
Emily MacDonald
Ryan E. Stolfus

James C. Hanson
Consulting Civil Engineer
A Corporation

TECHNICAL MEMORANDUM REPORT

To: Jesse Barton, Attorney
Gallery&Barton

From: Robert C. Wagner, P.E.
Brad Newton, Ph.D., P.G.

Date: June 30, 2011

Re: Review of "Biological Context of the Spring 2008 De-Watering Event in the Upper Mainstem of the Russian River."
National Marine Fisheries Service, Southwest Region. March 2011.

You requested a review of the referenced paper and its usefulness to support the SWRCB proposed Frost Regulation. In addition you asked that we review the SWRCB draft EIR and Draft Initial Statement of Reasons. In the course of the review, you asked us to consider the following:

1) The data presented in the March 2011 NMFS paper,
2) The March 2011 NMFS paper and assumptions and conclusions presented,
3) Whether or not the referenced paper supports the Frost Regulation,
4) If the SWRCB's proposed alternative (the WMDP approach) provides meaningful thresholds for identifying stranding causes,
5) That a single fish kill caused by events other than natural processes is significant.

Summary Statement

The referenced March 2011 NMFS paper presents what its authors call the "opportunistic" spot check observations of "substantial" stranding mortality of 10 steelhead fry along the gravel margin of the mainstem of the Russian River just north of Hopland on April 20, 2008, during a frost event. The authors present the observations as the basis to describe a significant threat to salmonids by estimating fish mortality caused by frost protection activities during the 2008 frost season.

EXHIBIT H

Observations

A NOAA Marine Fisheries Service (NMFS) Biologist spent approximately one hour during the morning of April 20, 2008, searching for stranded fish along dewatered margins of the river and covered 50 to 75 meters of river length. The NMFS Biologist documented 10 steelhead fry mortalities. The authors collected the USGS stream flow gauge measurement made at Hopland (gauge number - 11463000) for the basis of quantifying stage changes along a 28-mile reach of the Russian River between the East Branch/West Branch confluence and the USGS gauge north of Cloverdale (gauge number – 11462500), which is where stage reductions were still detected. The stage reduction measured at the Hopland gauge on April 20, 2008, was 0.2 feet (6.1 centimeters). The largest stage reduction measured at Hopland occurred on April 21, 2008, during the 2008 frost season, was 0.3 feet (8.5 centimeters), a rate of 1cm per hour, during which no attempt to make observations of strandings was made.

Authors' Estimated Take of Threatened Steelhead

Based on the observation of 10 steelhead fry mortalities, the authors estimate 25,872 fish kills occurred in the upper Russian River mainstem during the 2008 frost season. The estimate is based on the following assumptions: 1) there was an average stranding density of 10 stranded fish per 100 feet of stream for events equal to that observed on April 20; 2) stranding density varies by severity of events; and 3) a constant 25 percent of the river length had features likely to induce stranding during an event. The authors apparently developed a Severity Index linearly related to stage changes (e.g. the stage change of 0.2 feet and 0.3 feet is equivalent to a Severity Index of 1 and 1.5). The authors also assume that the stage change observed at the Hopland gauge is representative of the entire 28-mile reach of the Russian River.

Assumptions Inconsistent with Observations:

a) The observed stranding rate is actually between 4 and 6 fish kills per 100 feet, depending on the length of the survey conducted by the NMFS Biologist. Fifty meters is equal to 164 feet and 75 meters is equal to 246 feet. Therefore, the average is 5 fish kills per 100 feet as opposed to the 10 fish kills per 100 feet reported. The authors' estimated fish kills should be one-half the magnitude based solely on this inconsistency with the observations.
b) The Severity Index assumes a linear relationship between stage height and the observed fish mortality rate. This assumption implies that all stranding habitat for all stage magnitudes is functionally characterized by low gradient gravel substrate with constant slope where changes in stage affect stranding and mortality at the same rate per unit area of dewatered margin. However, the authors report that rivers and channels are complex arrangements of form and function including gravel substrate, side channel, backwater pool, and other features, and the likelihood of a linear relationship between stage and stranding habitat, uniformly distributed along the river is an assumption that should be

investigated and measured. Such an assumption is critical to the estimation of possible strandings and is measurable; however it has not been measured or investigated.

c) A stranding habitat represented by 25 percent of 28 miles of river reach assumes that all estimated stranding habitat functions the same as a gravel margin where the fish mortalities were observed. The authors report that stranding habitat includes gravel substrate, side channel, backwater pool, or some other feature where fish could potentially be stranded. However, the NMFS Biologist made observations of fish mortalities only on gravel margins of the mainstem and made no observations at any other places. The relationship between fish mortality and a severity index of 1 is likely very different in backwater pools and side channels where small changes in stage do not strand fish from water.

Assumptions without Basis and Inconsistent with Hydrologic Principles:

d) Stage changes observed at one location are difficult to translate to all points along a reach of river. This is because the increasing watershed area in the downstream direction along a river tends to attenuate stage changes that occurred upstream. Common characteristics of watershed hydrology are related to attenuation processes, such as: stream flow increases with increasing watershed area, channels have larger cross-sectional area with increasing watershed area, and channel gradients decrease with increasing watershed area. Complex geomorphological and hydrological conditions at a place may confound these typical trends causing non-linear down-stream changes making site-specific measurements necessary. Moreover, the cause of the stage change has no effect in the up-stream direction, yet the authors base the estimate on over 14 miles of river upstream from the observation site.

With respect to item #1 of your request, a single observation, and a stage-discharge hydrograph are the only data actually evaluated and presented in the March 2011 paper.

With respect to item #2 of your request, neither the authors' conclusions nor their assumptions are supported by the data or the observations reported.

Significance of Estimated Take of Threatened Steelhead

The authors state, "...the totality of evidence clearly indicates the fish kill was 'substantial' and that it is reasonable to conclude the threat to salmonids is significant."

Biological surveys have species-specific standard operating procedures conducted for a wide variety of purposes to identify impacts to the species. These scientific protocols are designed to reduce the uncertainty in field observations and to improve upon the decisions made from field observations. No survey protocols are reported in this work, and the authors' description of an "opportunistic spot check" implies no survey protocols were utilized. Therefore, the observations made are highly susceptible to bias and misinterpretation. The observations are thus difficult to evaluate because it is not known what process and what observations are utilized in the formation of the assumptions and conclusions. There is no doubt that NMFS and its scientists employ meaningful and identifiable biologic survey protocols in other investigations, but such protocols are not disclosed in the March 2011 paper, which suggests none were used.

A significant threat to salmonids by a particular frost event, or series of events, must be evaluated against a baseline to establish meaningfulness or statistical significance. In other words, without knowing the expected number of strandings under any condition excluding frost, when stage changes occur, we can't determine if a single frost event caused more than expected strandings, or contributed to the strandings. The authors developed no context regarding the observation of mortality. For instance, how many fish survived? What percentage of the total fish population subject to stranding for each 100 feet of river is represented by 10 fish as assumed or more importantly by 5 fish as observed? How many fish are stranded during the normal diurnal rise and fall in stage height? How many other causes, if any, are contributing to the fish mortality and what is the mortality rate associated with those causes? Without answers to these questions, it is impossible to determine if the stranding was truly caused by frost diversions or some other event.

With respect to item #3 of your request, the March 2011 paper is not supportive of the SWRCB's Frost Regulation.

The Frost Regulation effectively prohibits frost diversions until a variety of actions are undertaken to ensure frost diversions do not result in stranding mortality.

The authors characterize certain stage changes as "severe" and resulting in stranding. For example, the authors consider stage change a significant reason for fish stranding and report that a "severe" stage change of 8.5 cm occurred on April 21, 2008. No context is provided for characterizing this change as "severe."

As another example, the authors don't inform us about what would happen if there was a stage change of 8 cm instead of 8.5. Or a stage change of 4 cm, or a stage change within a range from 0 cm to some critical threshold value. The authors offer an insight into the significance of stage change by noting that a change of 8.5 cm, or a rate of 1 cm per hour, "is not in itself impressive," but concludes that this rate of change can be the cause of stranding.

We are left to consider a rapid change (or more rapid than 1 cm per hour change) as also causing stranding. The point is that stage change, apparently under any circumstance, is a cause for stranding and without a threshold value, or range of values, there is no way to determine what caused the stranding or far more importantly, how to prevent it.

The SWRCB suggests that a "stream stage monitoring program" be developed yet SWRCB does not provide any measurable criteria (nor does NMFS) on how to determine what would be measured. Without this criteria and solely in reliance on the March 2011 paper a "stream stage monitoring program" would be unable to distinguish strandings resulting from frost, irrigation, domestic use, diurnal changes, project operations (releases from Lake Mendocino for example), normal mortality for whatever reason, or any other process that caused any change in stage.

With respect to item #4 of your request, the SWRCB alternative (WDMP approach) provides no meaningful guidance or thresholds for distinguishing stranding causes. In our opinion, SWRCB has simply assumed that stage change causes stranding, frost protection causes stage change, and therefore, frost protection causes stranding. An extension of this logic would be that all causes of stage change cause strandings but only frost diversions will be regulated.

With respect to item #5 of your request, we consider that any stranding, any mortality, for any reason is significant. However, unless we are informed about the causes of stranding unrelated to diversions, and we have some idea about the number of expected strandings, and under what condition we could expect that to occur, we can not develop a program to avoid diversion-related stranding without simply stopping all diversions of water, developing some way to prevent diurnal fluctuations of stream stage, and stopping release changes from Lake Mendocino.

Exhibit I

Douglas Parkinson and Associates

890 L Street

Arcata, CA 95521

To: Jesse Barton, Gallery & Barton

From: Douglas Parkinson, B.S.

Date: July 5, 2011

RE: Review of "Biological Context of the Spring 2008 De-Watering Event in the Upper Mainstem of the Russian River. *National Marine Fisheries Service, Southwest Region, March 2011*

At your request, I reviewed the above-referenced paper produced by the National Marine Fisheries Services (NMFS). The purpose of my review was to determine whether the assumptions and conclusions made in the paper could be factually supported.

In order to accomplish my review, I visited the "stranding" site referenced in the paper as well as numerous other locations on the Russian River mainstem over a three-day period. Over this three-day period, I attempted to locate channel features that were consistent with either the "stranding" site, the assumptions and conclusions in the NMFS paper, or were similar enough to the "stranding" site such that they would pose a risk of stranding during a dewatering event. The results of my review are outlined below.

Executive Summary

The NMFS paper attempts to estimate the number of fish stranded during streamflow fluctuations over a period of several days in March and April of 2008. The only data point used in the estimate was a "spot check" that occurred on April 20, 2008, during which "spot check" ten steelhead fry were located stranded in a cobble gravel bar. Employing a variety of assumptions, the NMFS paper then extrapolated these ten stranded steelhead fry into 25,872 stranded steelhead.

DPA visited the stranding site and various other locations along the Russian River over a period of several days in an effort to either validate or discount the assumptions and conclusions made in the NMFS paper. Based upon these personal visits, the assumptions and conclusions in the paper are not factually supported.

The small area of stream margin conditions at stranding location appears to have unique fry stranding risks that were not noted at the other sites that were visited. Expansion of the stranding mortality from this limited area of potential stranding to other locations would lead to an excessive estimate of total fish mortality.

One other probable salmonid redd was noted at another location but the siting of the redd near the deep channel margins indicated that emergent fry were not at risk of stranding. Tributary streams were not evaluated for stranding and no attempt can be made at this time to assess the NMFS claim of stranding risks in tributary streams.

EXHIBIT I

Introduction

On the morning of April 20, 2008, during a frost event, a NMFS biologist documented the stranding mortality of ten steelhead fry along the gravel margins of the mainstem Russian River just north of Hopland and just below the Hopland USGS gauge. NMFS describes the effort as an "opportunistic spot check" that took approximately one hour searching dewatered margins of the river and covered 50 to 75 meters of river length. Because fry tend to get stranded in interstitial spaces, NMFS believed that a "significant portion of stranded fish went undetected even within the small area that was searched."

Apparently, due to the "undetected" number of stranded fry, NMFS produced a paper in March 2011 that extrapolated these ten fish stranded on one day in one location into a probable salmonid fry mortality of 25,872 fish from a series of streamflow reduction events from 3/23/08 to 4/24/08 over an approximate 28-mile reach of the Russian River from Cloverdale to Ukiah. NMFS made three important assumptions in making this estimate:

1. There was an average stranding density of 10 stranded fish per 100 feet of stream for events equal to that observed on April 20;
2. Stranding density varied by severity of events; and
3. A constant 25% of the river length had features likely to induce stranding during a low water event.

DPA performed a stream habitat review to examine these assumptions associated with the estimated fish kill. The stream habitat review took place along the affected reach during three days in June and July 2011 when stream flows (150-158 cfs) were similar to the stranding flows in 2008 (164-172 cfs). This review included surveying stream margin habitats at several locations and then comparing those characteristics to the physical conditions that represented stranding risks to salmonid fry during the 2008 frost season at Hopland gauge site.

For background, the periodic demand for water for frost protection in the upper Russian River basin coincides with the April-May emergence and emigration of steelhead fry from North coast streams (SEC, 1998, DFG, 2005). The newly emerged fry are more vulnerable to downstream displacement and stranding than the juvenile fish (Hunter 1992).

River channel configurations such as low gradient bars with cobble substrates and interstitial spaces create conditions that are attractive to steelhead fry. Hunter (ibid) noted that fry will remain stationary over cobble substrates but swim around or over gravel substrate. The fry will seek cover behind cobble substrates and as the water recedes will seek cover in the inter-cobble space and may become trapped. Fine-grained substrates with more surface flow permit fish to follow the flow across the surface rather than become trapped.

The fry become less dependent on the slower velocities near the margins as they grow and move out into the channel where faster velocities are present and there is a reduced risk of stranding due to dewatering.

Due to these variables, it is difficult, but not impossible, to estimate fish losses during dewatering events. In order to do so accurately, significant background material must be available and stream surveys must be performed. DPA has performed similar studies in the past for different clients and believes it is qualified to comment on procedures used and assumptions made in NMFS's 2011 paper. We will go through each assumption below.

There was an Average Stranding Density of 10 fish per 100 Feet

Fish density would be a function of emergence and emigration timing of the fry from known steelhead redd locations. Without knowing the approximate locations and density of the spawning locations there is no reliable way to estimate the numbers of emergent fry at risk or estimate the length of the reach of the Russian River where fry are at risk. The NMFS paper does not appear to consider these factors. The threat for fry strandings would increase during peak emergence from areas of steelhead redd locations with stranding site characteristics similar to the Hopland gauge. The emergent fry are growing quickly and we would expect a diminishing risk of stranding over time. Even if this risk could be quantified, DPA noticed that the density would not be ten fish per 100 feet, but would instead be five fish per 100 feet, due to a mathematical error in the NMFS paper. [1]

The estimated emergent fry stranding mortality of 25,872 fish was based on the interpretation of the stage reductions at the Hopland Gauge site and area of stream margin habitat where the ten steelhead fry mortalities were found. This estimated fry mortality is an unknown percent of the total fry population in the upper Russian River.

The only estimates of the steelhead fry populations come from the Sonoma County Water Agency's (Chase, 2005) out migrant trapping operation at the Mirabel rubber dam near Forestville. The rotary screw traps do not capture all of the out migrating fish. The percent of capture is referred to as the efficiency of the trap. The efficiency of a trap to capture fish depends on the percent of the streamflow, the trap samples and the location of the trap in the channel. The trap efficiency or ability to capture a percent of the total fish population passing was performed on juvenile Chinook fry which were a bit larger than the steelhead fry. The trapping efficiency may vary due to behavior, fish size and flow conditions. The numbers of fish captured are also a function of times the trap was not operating for administrative purposes. Efficiency for the Chinook captures from 2000-2004 ranged from 7.4 to 11 percent. Within some variation, capture of steelhead fry may be considered within that range.

Weekly capture of wild young-of-the-year steelhead from March through May in the Russian River near Mirabel, 2000 – 2004.

Year	2000	2001	2002	2003	2004
Fry (YOY)	763	150	5,843	1,088	1,411

The present population of out migrating steelhead fry from the upper Russian is not known. However, if similar to these capture counts, expanding the fry capture rate of 7-11 percent of the population still comes

[1] 50 meters is equal to 164 feet and 75 meters is equal to 246 feet.

up to an estimated total fry population this is significantly smaller than the numbers of fry stranded as estimated by NMFS.

The field reconnaissance to several sites including gravel bars and tributary confluences revealed only one probable steelhead redd location downstream of Robinson Creek. The redd near the mouth of Robinson Creek was in the wetted channel and not on the channel margin as the redd downstream of the Hopland gauge. The presence of highly mobile small gravels and sands at most of the riffles observed are not considered stable for redd construction by large salmonids (Gallagher, 2007).

Two lifetime local residents had observed Chinook spawning frequently in the Russian near Hopland but no steelhead (Curt Rushton and Andy Ruddnick, pers. comm.). Chinook spawning takes place in the main channel probably over the larger cobble that was present in some locations. Steelhead spawning has been observed in the upper reaches of the tributaries with which Rushton and Ruddnick were familiar.

The stranding site location had channel features that were unique for emerging steelhead fry, which included small depressions that may have been created by redd building activity. Fry emerging from this location would be at the tail of a pool and could remain in the low velocity water. Fry emerging on the channel margins would have been swept downstream and not been at risk of stranding.

The dominant substrates at the riffle crests observed on the Russian River were small and large gravels on the surface. The subsurface layer was comprised of finer materials of sand and small gravels. The materials were easily moved by walking over them, which also means they are poor spawning habitat because of their mobility.

Since the NMFS paper does not appear to consider the approximate locations and density of the spawning locations, the timing of fry emergence or emigration, and the apparent lack of adequate spawning habitat located during DPA's reconnaissance review, among other factors, the assumption that there was an average stranding density of ten (or even five) fish per 100 feet appears without merit.

Stranding Density Varied by Severity of Events

As a general concept, the likelihood of stranding would vary depending upon the severity of events. However, as discussed here, the stranding density has not been established, so this is largely an unknown variable.

A Constant 25 Percent of the River has Features Likely to Induce Stranding

The estimate of percent stranding habitat from the observed stranding was one of the assumptions employed to determine the estimated fish kill in the upper Russian River main stem during the 2008 frost season. The stranding site was described as being the first gravel bar downstream of the Hopland gauge site.

The site visit performed on June 28, 2011, by DPA revealed a likely but marginal site for spawning on the left stream margin at the tail out of a pool and adjacent to a riffle crest. The site was out of water at the estimated 150 cfs present during the site review. While there was some active erosion on the right channel margin in a scour pool, it is assumed that most of the channel configuration present during the field review is approximately the same as in 2008. The riparian vegetation on the gravel bars suggested a similar stable channel condition. The gravel bar appears to serve as an elevation control for the USGS Hopland gauging station.

DPA also noticed that the stream margin conditions of the Hopland USGS stranding location appeared to have unique fry stranding risks that were not noted at the other sites that were visited. Two other probable salmonid redds were noted at other locations but the sitings of the redds near deep channel margins indicated that emergent fry were not at risk of stranding. All of the gravel bars reviewed had coarse material on surface and fine grained material subsurface which would permit surface runoff. These conditions are very dissimilar from the tail out of the run at the riffle crest on the stream margin at the Hopland gauge site.

The one picture (figure 3, NMFS, 2011) of the fish stranding is a recently emerged fish, which we estimate at about 27 mm. This is the approximate size of the smallest steelhead fry that are captured from traps on Redwood Creek, near Orick in Humboldt County (Sparkman, 2005), and the smallest sizes noted at the Sonoma County Water Agency's out-migrant trapping site near Forestville (Chase, 2005).

Fry that emerge from redds that are immediately upstream from the rotary screw traps are swept by the current into the trap before they can reach the slower water velocity areas on the margins. The photo of the stranded fish is on what appears to be an estimated 45-50 mm gravel clast which would categorize it as small gravel (>8 – 64 mm) and assume it is at the stranding site. The clast appears to be embedded by smaller gravel and sand. The embedded nature (embeddedness is an approximation of the extent that gravel or cobble substrates are surrounded by fine materials) suggests no interstitial space present that would provide hiding cover and increase the difficulty of locating stranded steelhead fry.

The substrate at the possible redd location was a combination of large (64 -128 mm) and small gravels (8 - 64 mm) on top of fines underneath. Small cobbles were estimated at about 10 - 20%. There were slight depressions of about 0.2' to 0.3' depth within the site. The measured area of potential stranding based on the presence of the cobble and shallow depression was 14 X 16'. The site was an estimated 0.3' above the present water surface.

Therefore, the amount of potential stranding habitat was limited to the top of the gravel bar and not along the channel margins. The steep slopes, sand and gravel composition of the channel margins and water velocities reduced the chances that recently emerged fry would seek refuge at these locations. As discussed above, during three days of field survey, we were unable to locate any additional sites that provided the same type of habitat as the stranding location, even though more effort was expended in attempting to locate these sites. Based on our field visits and personal observations, the assumption of 25 percent of a 28-mile stretch of the Russian River providing similar habitat features as the Hopland stranding site is unsupported and unreliable.

Response to NMFS (2011) Comments on Page 4

In addition to the assumptions on page 4, NMFS also lists some "additional considerations" that apparently influenced its estimate.

- *Channel morphology, especially with respect to the distribution of gravel bars, is unknown and varies.*

Few gravel bars were present due to the encroachment of the riparian vegetation along the channel margins. Channel incision in the fine grained small gravel and sand substrate resulted in up to 45% slopes of gravel bars at the stream margins visited during the reconnaissance. The encroachment of the riparian vegetation adjacent to the stream channel prohibits an accurate assessment of the presence of gravel bars from aerial photos.

Tributary streams were not evaluated for stranding and no attempt can be made at this time to assess those stranding risks.

Citations

Chase, S. D., R. C. Benkert, D. J. Manning, S. K. White, and S. A. Brady. 2005. Sonoma County Water Agency's Mirabel Rubber Dam/Wholer Pool Fish Sampling Program: Year 5 Results. Sonoma County Water Agency, Santa Rosa,Ca.

Gallagher, S.P., P.K.J. Hahn and D.H. Johnson, 2007. Redd counts. Pages 197-233 in D.H. Johnson et al. Salmonid field protocols handbook: techniques for assessing status and trends in salmon and trout populations. American Fisheries Society, Bethesda, Maryland.

Hunter, M. 1992 Hydropower flow fluctuations and salmonids: a review of the biological effects, mechanical causes and options for mitigation. Technical Rept No. 119. State of Washington, Dept of Fisheries.

National Marine Fisheries Service. 2011. Biological context of the spring 2008 de-watering event on the upper mainstem of the Russian river. Unpublished memo. National Marine Fisheries Service, Southwest Region.

Pacific Gas and Electric Company. 2004. Rock Creek-Cresta (FERC No. 1962) Recreation and Pulse Flow Biological Evaluation: Stranding and Displacement Studies Year 2002-2003. Prepared for Technical and Ecological Services, PG&E, San Ramon, Ca. Prepared by Thomas R. Payne & Associates, Arcata, CA.

SEC (Steiner Environmental Consulting). 1998 Potter Valley Project Monitoring Program. (FERC No. 77 Article 39) Effects of operations on Upper Eel River anadromous salmonids. Final Report. Prepared for: Pacific Gas and Electric Company Technical and Ecological Services 3400 Crow Canyon Road, San Ramon, Ca

Sparkman, M.D. 2005. Final: Upper Redwood Creek juvenile salmonid downstream migration study, a five-year summary report. California Department of Fish and Game, Anadromous Fisheries Resource Assessment and Monitoring Program. Annual Report, study 2i4; 87 p.

Personal Communications

Rushton, Curt. July 1, 2011. Vineyard Manager. Hopland, CA

Ruddnick, Gary. July 1, 2011. Vineyard Owner. Hopland, CA

Exhibit J

Offstream Storage Summmary

Ranch/Vineyard	Acres *	Pond Size (AF)	Cost	Demand Reduction (CFS)	Status	AWEP Funded?
Fetzer Blue Heron	34	17.6	$47,000	3.8	Completed in 2009	No
Fetzer/Dolan	40	17	$20,000	4.4	Completed in 2009	No
Sawyer	45	Not Available	$80,000	5.5	Completed in 2009	Yes
La Ribera	110	50	$500,000	13.4	Completed in 2009	Yes
Beckstoffer	150	68	$389,000	18	Completed in 2009	No
Fetzer Sun Dial	88	32.9	$386,000	10.8	Completed in 2009	No
Fetzer Los Cerros	44	19.4	$149,000	5.4	Completed in 2009	No
Not Available	115	26	$500,000	14.1	In Progress	Yes
Not Available	73	13	$173,000	8.9	In Progress	Yes
Not Available	60	11	$100,000	7.3	Completed in 2010	Yes
Totals			**$2,344,000**	**91.6**		

* Acres now protected using offstream storage

EXHIBIT J

Exhibit K

Affidavit on
Stream Fluctuations

1. My full name is Alvin R. Cadd

2. The information contained in this affidavit is based upon my personal knowledge.

3. I currently live within one half mile of Gird Creek , which is a tributary to the Russian River.

4. I have lived on this tributary for 80 years.

5. I have personally observed stream flow/stage fluctuations in this tributary.

6. I have also observed both, adult and juvenile Steelhead stranded during dry periods in winter months

7. Based upon my observations, I have not seen stream flow/stage fluctuations due to frost protection activities in this tributary. I have, however, seen fluctuations due to natural causes (e.g. onset of warm weather, lack of precipitation, etc.).

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 21, 2011
(Month and day)

Signature: Alvin R. Cadd

EXHIBIT K

Affidavit on
Stream Fluctuations

1. My full name is Harry Black.
(Print name)

2. The information contained in this affidavit is based upon my personal knowledge.

3. I currently live one half mile from Gird Creek, which is a tributary to the Russian River.

4. I have lived on this tributary for 30 years.

5. I have personally observed stream flow/stage fluctuations in this tributary.

6. Based upon my observations, I have not seen stream flow/stage fluctuations due to frost protection activities in this tributary. I have, however, seen fluctuations due to natural causes (e.g. onset of warm weather, lack of precipitation, etc.).

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 20, 2011
(Month and day)

Signature: Harry Black

Affidavit on
Stream Fluctuations

1. My full name is David Fanucchi.
   (Print name)

2. The information contained in this affidavit is based upon my personal knowledge.

3. I currently live adjacent to Gird Creek which is a tributary to the Russian River.

4. I have lived on this tributary for 63 years.

5. I have personally observed stream flow/stage fluctuations in this tributary.

6. Based upon my observations, I have not seen stream flow/stage fluctuations due to frost protection activities in this tributary. I have, however, seen fluctuations due to natural causes (e.g. onset of warm weather, lack of precipitation, etc.).

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 20, 2011
(Month and day)

Signature: David Fanucchi

Affidavit on
Stream Fluctuations

1. My full name is James R. Young

2. The information contained in this affidavit is based upon my personal knowledge.

3. I currently live adjacent to Gird Creek, which is a tributary to the Russian River.

4. I have owned property on this tributary for 27 years.

5. I have personally observed stream flow/stage fluctuations in this tributary.

6. Based upon my observations, I have not seen stream flow/stage fluctuations due to frost protection activities in this tributary. I have, however, seen fluctuations due to natural causes (e.g. onset of warm weather, lack of precipitation, etc.).

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 27, 2011

Signature: James R Young

Affidavit on
Stream Fluctuations

1. My full name is Alfred White.

2. The information contained in this affidavit is based upon my personal knowledge.

3. I currently work adjacent to Morrison Creek, which is a tributary to the Russian River.

4. I have worked next to this tributary for 20 years.

5. I have personally observed stream flow/stage fluctuations in this tributary.

6. Based upon my observations, I have not seen stream flow/stage fluctuations due to frost protection activities in this tributary, since there are no diversions on it. I have, however, seen fluctuations due to natural causes (e.g. onset of warm weather, lack of precipitation, etc.) resulting in stranding of adult steelhead as well as fry.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 20, 2011

Signature: ____________

Affidavit on
Stream Fluctuations

1. My full name is James R. Young

2. The information contained in this affidavit is based upon my personal knowledge.

3. I currently live adjacent to Gird Creek, which is a tributary to the Russian River.

4. I have owned property on this tributary for 27 years.

5. I have personally observed stream flow/stage fluctuations in this tributary.

6. Based upon my observations, I have not seen stream flow/stage fluctuations due to frost protection activities in this tributary. I have, however, seen fluctuations due to natural causes (e.g. onset of warm weather, lack of precipitation, etc.).

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: June 27, 2011

Signature: James R Young

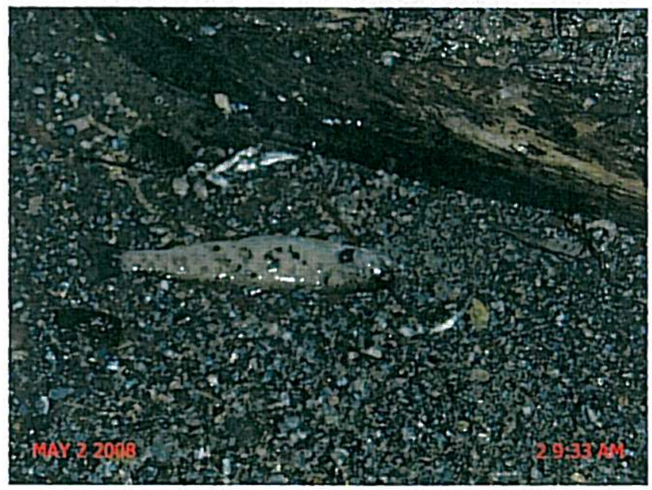
Affidavit on Stream Fluctuations

1. My full name is Larry Raymond Cadd
2. The information contained in this affidavit is based on my personal knowledge.
3. I currently live in Alexander Valley and own property through which the Russian River flows. I own property through which un-named tributaries flow. I am familiar with other small streams in Alexander Valley.
4. I have lived in the same area of Alexander Valley for 62 years.
5. I have personally observed stream flow/stage fluctuations over the years.
6. Based on my observations, I have not seen stream flow/stage fluctuations due to, or coinciding with, frost protection activities in the Russian River, (data confirmed) Miller Creek, Gill Creek, Gird Creek, or un-named streams on my property. I have , however, seen fluctuations due to natural causes in all of these streams (e.g. lack of precipitation, warm weather, cool weather where flows increase and other natural causes). I take particular interest in stream flows and salmonid activities due to my lifelong interest in steelhead fishing in the Russian River.
7. Attachments included.

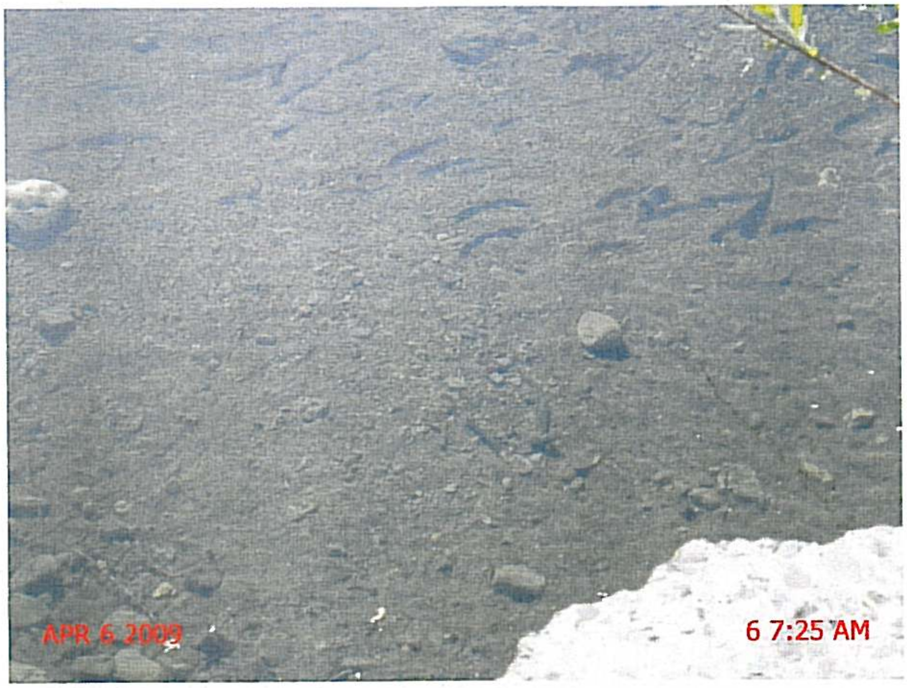
I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date 6/23/11

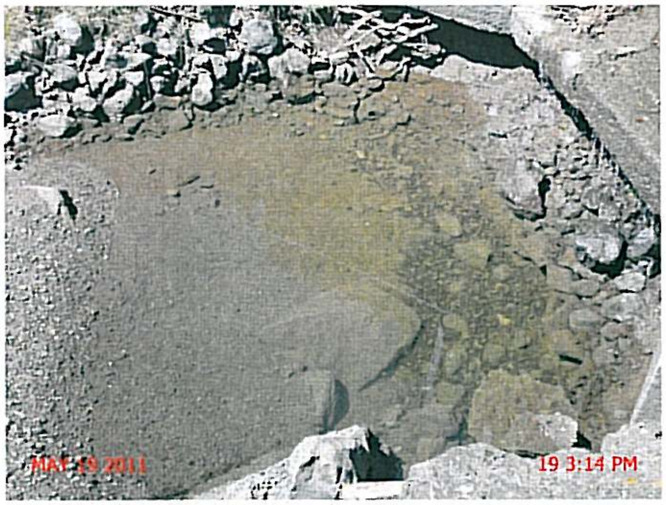
Signature Larry Cadd



Gird Creek after after a rainfall of less than .5 inch. The stream is receding in this example, one photo shows the point where stream flow is insufficient to overcome infiltration and flow goes underground. There are many (est100 more or less) live fish upstream 1 1/2 to 2 inches in length. The stranded fish in the photos are all downstream of the point where flow goes underground and were stranded as the flow receded after rains stopped. These routine and naturally occurring events could be confused with fish kills caused by pumping should the two events coincide by chance.



Gill Creek, one photo showing trapped fish at a county road crossing and another photo showing the point where stream flow is insufficient to overcome infiltration and the stream goes underground. These trapped fish cannot move upstream due to a manmade obstruction and cannot move downstream due to insufficient flow. These routine and naturally occurring events could be confused with fish kills caused by pumping should the two events coincide by chance.



An un-named creek in Alexander Valley

The photos demonstrate the rate (note date and time) at which streams dry up after small rain events. The water rises and fish move around, unable to swim back upstream, in this case a man made obstruction. These routine and naturally occurring events could be confused with fish kills caused by pumping should the two events coincide by chance.

The following photos demonstrate that there are frequent **naturally** occurring fish strandings in Alexander Valley streams. All photos where taken during times of no agricultural pumping activities.

The following photos demonstrate that there are frequent **naturally** occurring fish strandings in Alexander Valley streams. All photos where taken during times of no agricultural pumping activities.

Exhibit L

OFFICE OF THE AGRICULTURAL COMMISSIONER

Agricultural Commissioner
Sealer of Weights and Measures
www.sonoma-county.org/agcomm

133 Aviation Boulevard, Suite 110
Santa Rosa, CA 95403-1077
Phone (707) 565-2371 Fax (707) 565-3850

For Office Use Only			
Date Received			
Registration Date:			
Expiration Date:	12/31/2011		
Fee Paid:	$	Ck No.	
Registered By (Initials):			
Registration No.	AFM11-		

Vineyard & Orchard Frost Protection Registration

NOTE: Incomplete or faxed registrations will not be accepted. Registration must include map of the site. Use N/A for all blank spaces.

******Fill out one form for each site to be registered******

Owner's Name:					
Mailing Address					
City		State		Zip	
Phone		Fax		Cell	
Email Address					

Authorized Representative's Name: (Leave blank if the same as above)					
Mailing Address					
City		State		Zip	
Phone		Fax		Cell	
Email Address					

Billing Address:					
City		State		Zip	
Phone		Fax		Cell	
Email Address					

Site Address:	
Assessor's Parcel Number(s)	
Corresponding Pesticide Permit Site Id #(s)	
Total Frost Protected Acreage	
	Registration Fee $64.00

I certify that the information provided is correct and valid to the best of my knowledge:

*Signature ______________________ Owner Or Authorized Representative (Circle One)

Print Name ______________________ Date ______________

****Registration may be signed only by the owner of the property or the authorized representative.***

EXHIBIT L

Frost Protection System Inventory

Check all that apply:	
☐ Vineyard	☐ Orchard

Registration No.	AFM11-
APN #(s):	

Please use an additional sheet if additional wells, Point of Diversion (POD's), or Frost Pumping Systems are used per site. Label your map with the Map Id #s that you assign below (1, 2, 3, 4, etc.).

System Type (Check all that apply)

	Type	No. Of Acres Protected	Gallons Per Acre Per Minute
☐	Sprinklers		
☐	Microsprinklers		

Map Id #		No. Of Acres Protected
	Frost Pumping System(s)	
	Frost Pumping System(s)	

Storage Type (Check all that apply)

Map Id #	Storage	Type	Acre Feet	Recharge Rate	Source (River, Stream, Well, Etc.)
	☐	Reservoir/Pond			
	☐	Offsite			
	☐	Tank			

Source Of Water (Check all that apply)

Map Id #	Type		Gallons Per Minute (GPM)		
	☐	Recycled Water			
	☐	Direct Diversion from River or Stream			
	☐	Shared System (Note Type)			
	☐	Sub Surface (Sump/French Drain)			
	☐	Surface Drainage			
	☐	Other Water Source			
			GPM – from pump (pump rating)	Depth – (pump setting)	Distance (in feet) from stream
	☐	Well			
	☐	Well			

☐	**Aerial map is attached with frost protected area highlighted, Assessor Parcel Number(s) indicated, and water sources marked by using map numbers from above (registration requirement)**

DISCLAIMER: This Registration is solely for the purpose of producing an inventory of frost protection systems. You may need permits or authorizations from other regulatory agencies to divert or use water for frost protection.

Exhibit M

- Harrelson, Cheryl, C.L. Rawlins and John Potyondy. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Techniques*. USDA Forest Service Report RM-245.

- McCobb, Timothy D. and Peter K. Weiskel. 2003. *Long-Term Hydrologic Monitoring Protocol for Coastal Ecosystems*. U.S. Geological Survey Open-File Report 02-497

- Rantz, S. E. 1982. Measurement and Computation of Stream Flow: Volume 1. *Measurement of Stage and Discharge*. U.S. Geological Survey Water-Supply Paper 2175

- Sauer, V.B., and Turnipseed, D.P., 2010, *Stage measurement at gaging stations: U.S. Geological Survey Techniques and Methods* book 3, chap. A7, 45 p. (Also available at http://pubs.usgs.gov/tm/tm3-a7/.)

- Moyle, P. B., and G. M. Kondolf. 2000. Fish bypass flows for coastal watersheds: Review of proposed approaches for the California State Water Resources Control Board, June 2000.

- Jackson, D., and L. Marcus. 2002. Restoration of Parsons Creek: Taking an Experimental Approach North Coast Regional Water Quality Control Board. 319 grant

- Cox, M. H and C. Hatch. 2003. Water Temperature, Stream flow, and Ground-Water Elevation in and Adjacent to the Russian River between Hopland and Guerneville, Ca from 1998-2002. *US Geological Survey Open File Report* 03-454

- Metzger, L. F., C.D. Farrar, K.M. Koczot, and E.G. Reichard. 2006. Geohydrology and Water-Chemistry of the Alexander Valley, Sonoma County, California. *US Geological Survey. Scientific Investigations Report* 2006-5115

- Deitch, M. J., G.M. Kondolf, and A.M. Merenlender. 2009a. Hydrologic impacts of small-scale instream diversions for frost and heat protection in the California wine country. *River Research and Applications* 25: 118-134.

- Deitch, M. J., G. M. Kondolf, and A.M. Merenlender. 2009b. Surface water balance to evaluate the hydrological impacts of small instream diversions and application to the Russian River basin, California, USA. *Aquatic Sciences: Marine and Freshwater Ecosystems* 19: 274-284.

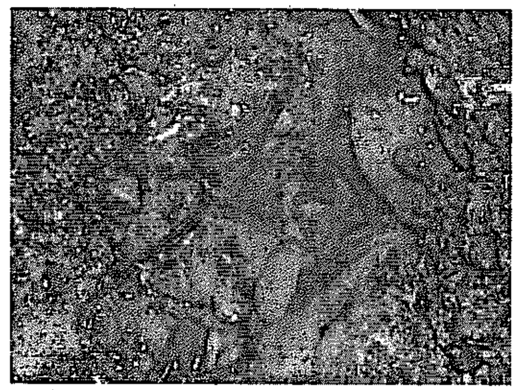
- U.S. Geologic Survey website, www.usgs.gov

Exhibit N

Feds blame farmers for Russian River fish kill

By GLENDA ANDERSON
THE PRESS DEMOCRAT

Published: Friday, May 6, 2011 at 6:55 p.m.



NOAA

Officials with the National Oceanographis and Atmospheric Administration says these steelhead trout fingerlings are among 150 they found stranded in the Russian River in Redwood Valley. Twenty one were found dead from what officials said was a sudden drop in water levels cause by vineyard frost protection spraying

The deaths of at least 21 juvenile steelhead trout and the stranding of 150 in puddles following a drop in water levels in the west fork of the Russian River near Redwood Valley has focused new attention on farm practices.

The fish kill — discovered April 28 — coincided with farmers drawing water to spray for frost protection, adding fuel to federal fisheries officials' contention that the practice needs to be strictly regulated to protect endangered and threatened species.

"This incident illustrates that voluntary efforts have not prevented frost diversion-related fish kills and confirms the need to regulate water use," said Dan Torquemada, assistant special agent in charge with the National Oceanic and Atmospheric Administration's law enforcement office.

Mendocino County farmers, primarily grape growers, and water officials disputed Torquemada's conclusion, citing data from a U.S. Geologic Survey gauge on the river in Redwood Valley that they say did not show a significant drop in flows.

The river level dropped just under 1 centimeter during the eight hour period beginning just before midnight the day before the fish were discovered, said Sean White, a fisheries biologist and director of the Mendocino County Russian River Flood Control and Water Conservation Improvement District.

More dramatic was a 5-inch drop in the depth in the 12 days prior to the discovery of the stranded fish, he said.

EXHIBIT N

"The major impact is from the west fork drying up from warm days and no rain," White said.

The west fork of the Russian River normally dries up once the rains stop because, unlike the main stem, it is not fed by releases from Lake Mendocino, the reservoir behind Cayote Dam north of Ukiah.

Farmers and local, state and federal water and fisheries officials have been locked in a three-year debate over how best to prevent fish from being killed when grape growers pump water from the river and its tributaries.

The debate began in 2008 when threatened and endangered fish in the Russian River in Sonoma and Mendocino counties were stranded and died, apparently as the result of too many farmers taking water at once. Another incident was reported in Sonoma County in 2009..

State officials have warned that they will impose regulations that include prohibiting diversions for frost protection from March 15 through May 15 in the absence of an acceptable local river management plan.

But the factions are having difficulty agreeing. Farmers prefer voluntary methods while some federal officials have suggested a ban on use of river water for frost protection. In Sonoma County, a proposed ordinance was scuttled in part by objections from some growers who did not want to report how much water they take from the river.

White recently told officials at a Sacramento frost protection meeting that he didn't think their proposed regulations would result in more water in the streams.

There also is disagreement about the magnitude of the problem.

Federal fisheries officials estimate that frost protection killed 25,000 fish near Hopland in 2008. White said that estimate is ludicrous because it's based on finding about 10 dead fish.

"There's no evidence supporting beyond 10," he said.

Fisheries officials have not estimated how many fish may have died this time, but they believe it's many times more than the 21 they found, Torquemada said.

He also said his agency has not yet determined who is responsible for the latest fish deaths.

No one was cited or fined for the 2008 fish kills in Mendocino County but a Healdsburg grape growing family was fined $115,500 in connection with the deaths of coho salmon in 2008 and 2009 in Felta Creek.

executive director, said last month.

A sticking point has been monitoring and identifying diversions by individual growers. Vineyard owners view them as an intrusion while federal fisheries biologists say they are key to an effective program.

Local solutions include keeping closer track of the weather and water flows and coordinating water draws from the river. In Mendocino County, new water flow gauges near Ukiah allow local agencies to more quickly request additional releases from Lake Mendocino to compensate for a spike in water use, White said. But the best protection for both the river and farmers are individual water reservoirs, which many farmers now have.

Mendocino County Farm Bureau Executive Director Devon Jones said the allegation that farmers caused last week's fish kill hurts both the reputation of farmers and the chances of a compromise solution.

"There will be negative impacts," she said.

Exhibit O

Features of Major Groundwater Basins of the Russian River from Ca. Department of Water Resources Bulletin 118

Groundwater Basin	Areal Extent	Depth of Deposit	Groundwater Well Production gallons per minute (gpm)	Groundwater Storage Capacity	Status of Groundwater Level
Redwood and Ukiah Valleys	59 sq. miles	Alluvium -50-80 ft.; Continental deposits 200 ft.	Alluvium 50-1200 gpm	Alluvium, terrace, river channel deposits, continental deposits: 324,000 ac-ft.; alluvium and terrace deposits only: 75-100,000 ac-ft., river channel deposits only 35,000 ac-ft.	Stable
Hopland Valley	8.4 sq. miles	Alluvium un- to semi confined - 50 ft.; Continental deposits - 2000 ft.	Alluvium 500 gpm; Continental deposits 1-50 gpm	Alluvium 20,000 ac-ft.	Stable
McDowell valley	2 sq. miles	Alluvium 200 ft.; Continental deposits - 2000 ft.	Alluvium 500 gpm; Continental deposits 1-50 gpm	Not available	Stable
Alexander Valley - Cloverdale sub-basin	10 sq. miles	Alluvium 10-80 ft.	Alluvium 50-200 gpm	55-71,000 ac-ft.	Stable
Alexander Valley - Alexander Valley sub-basin	37 sq. miles	150-200 ft.	50-500 gpm	762,000 ac-ft.	Stable
Knights Valley	6 sq. miles	30-150 ft.	2-50 gpm	15,000 ac-ft.	Unknown
Santa Rosa Valley - Healdsburg sub-basin	245 sq. miles	Alluvium -25-50 ft.; Wilson Grove Formation - 300-1500 ft.	Alluvium 200-500 gpm; Terrace deposits 10-5- gpm; Glen Ellen Formation 1-140 gpm	489,000 ac-ft.	Stable
Santa Rosa Valley - Santa Rosa sub-basin	125 sq. miles	Alluvium -30-100 ft.; Wilson Grove Formation - 300-1500 ft; Glen Ellen Formation 1500-3000 ft.	Alluvium 200-500 gpm; Wilson Grove Formation 100-1500- gpm; Glen Ellen Formation 10 gpm	4,313,000 ac-ft.	Stable

EXHIBIT O

Exhibit P

P6C

CH

DWR

2011 MAY 17 AM 9:50

DIV. OF WATER RIGHTS

RUSSIAN RIVER PROPERTY OWNERS ASSOCIATION

3845Hwy 128 Geyserville Ca.

RECEIVED

MAY 18 2011

SWRCB EXECUTIVE

State Water Resources Control Board

P.O Box 2000 Sacramento Ca. 95812

May 12, 2011

Dear Chair Hoppin and Members of the Board,

The Russian River Property Owners Association (RRPOA) has been actively working to understand the groundwater and surface water dynamics of streams and the aquifer in Alexander Valley. As part of our effort, we have worked with Dr. Matthew Deitch, Environmental Scientist at the Center for Ecosystem Management and Restoration (CEMAR) over the past three years to monitor water levels in Russian River tributaries and the aquifer, with special attention to spring and summer. We have asked Dr. Deitch to prepare a preliminary report summarizing the data we collected this year, along with some interpretation of the trends detected. This is a preliminary report, and we plan to have a more detailed report to share at the end of summer.

We believe the data presented in this preliminary report shows that streamflow recedes naturally in the creeks in Alexander Valley through the springtime, and also that streamflow recedes naturally from downstream to upstream. The portion of each stream that runs through the alluvial Alexander Valley lose water to the aquifer naturally, even in the absence of groundwater pumping. This is especially evident in Gill Creek: grape growers along Gill Creek did not pump water for frost protection at any time in March or April 2011, and the stream was disconnected from the Russian River by April 8.

We hope that this report helps you to understand the dynamics of hydrology in the valley we call home. As we've said before, we would be happy to share our observations with the SWRCB board or its staff on location in Alexander Valley any time you'd like. Sonoma County is a beautiful place all year round, and you are more than welcome.

Sincerely,

Al Cadd

Al Cadd

President, Russian River Property Owners Association

EXHIBIT P

Preliminary Water Resources Report, Alexander Valley:

Gill Creek and Gird Creek Study Area, April 2011

Prepared by Matthew Deitch, Center for Ecosystem Management and Restoration,

For the Russian River Property Owners Association

Draft: May 11, 2011

The hydrology of the Alexander Valley region of Sonoma County in Spring 2011 was typical for the month of April when compared to long-term trends. Following heavy rainfall in March, little rainfall was recorded through April, so streams receded over the month. The purpose of this preliminary report is to describe the recession of streamflow in two Alexander Valley streams, Gill Creek and Gird Creek (Figure 1), as well as additional data describing instream and adjacent groundwater levels at one particular location through the first half of April. These data illustrate the flow recession that occurs at a given location on each creek through the season, as well as the change in streamflow that occurs from upstream to downstream at times when measurements were made.

Streamflow data

Streamflow in Gill Creek was measured at three locations on April 8, April 17, and April 29, 2011 (Figure 2). The downstream measurement location on Gill Creek is approximately 1500 ft from its confluence with the Russian River, and though streamflow was measured at this downstream-most location on April 8, Gill Creek was disconnected from the Russian River farther downstream. On April 8, streamflow from the upstream Gill Creek site to the downstream site receded 5 ft^3/sec. Streamflow measurements showed similar trends in recession along Gill Creek from upstream to downstream on April 17 and April 29. By April 29, the middle Gill Creek site was no longer flowing (Table 1). According to RRPOA surveys, no water was used for frost protection in the Gill Creek watershed or surrounding properties.

Streamflow measured at Gird Creek field sites (Figure 3) generally showed similar trends (Table 2). Unlike Gill Creek, streamflow on April 8 increased slightly from the upstream site to the middle site; but like Gill Creek, flow was much less at the most downstream site than the upper two sites. Streamflow receded from upstream to downstream on April 29, with the lower study site being completely dry. Also, like Gill Creek, streamflow at all Gird Creek sites fell by more than 60 percent from April 8 to April 29. According to RRPOA surveys, no water had been used for frost protection prior to April 8 (water was used on only one day for frost protection in 2011, on April 9).

Stage data

Among the three instruments installed near Gird Creek (Figure 4), data within this Gird Creek study area during the eleven-day period April 1 – April 11 showed varying trends. Over that time, the water level in the Gird test hole (in the adjacent aquifer, approximately 40 ft from Gird Creek) showed a steady recession of 4.7 ft (Figure 5). Over that same time period, the water level in Gird Creek receded 0.38 ft. Because of high water levels during March and April 2011 in the mainstem Russian River, the mainstem gauge was not installed until April 7; but over the period April 7 – April 11, the water level in the Russian River receded 0.57 ft. These data show that all three water bodies considered as part of this study receded in different ways during the study period. The large recession in groundwater level in April may be attributed to relatively recent rain (with more than 5 inches of precipitation recorded at a nearby Windsor, CA CIMIS station over the previous 12 days March 19 – March 31) and a gradual decline in water table as the water flowed through the aquifer to Gird Creek and the Russian River. In contrast, Gird Creek receded very little over the first two weeks in April; the last day rainfall recorded nearby (at Windsor) was March 27, and the four-day period between March 27 and April 1 may have given the upslope portion of the watershed sufficient time to produce runoff as a result of rainfall. Similar variations in recession were illustrated in the 2010 RRPOA Frost Protection Monitoring Report.

On the morning of April 9, 2011, air temperatures in part of Alexander Valley dropped below thresholds that could cause grape buds to freeze; and as a result, grape growers in the region used water for frost protection over approximately 1,100 acres of grapes. During this period, the water level in Gird Creek remained consistent and showed no recession as a result of nearby groundwater pumping (Figure 6). Water levels in the Russian River and in the nearby aquifer receded gradually throughout the week surrounding April 9 (also Figure 6). Water level in the Russian River appeared to recede slightly more quickly on the afternoon of April 8 and the afternoon of April 9; but similar comparisons described in the Russian River Property Owners Association frost protection report from 2010 will be used to illustrate that these are likely not the result of frost protection water use in Alexander Valley in a more comprehensive 2011 RRPOA Frost Protection Monitoring Report. The water level in the aquifer beside Gird Creek receded slightly more quickly on the morning of April 9, during the period when water was used for frost protection, though water level in Gird Creek did not mirror this pattern of accelerated recession during the frost protection period.

Table 1. Gill Creek Flow Measurement at three locations (over a 4100 ft distance).

Sample Date	4/8/2011	4/17/2011	4/29/2011
sub-reach			
Upstream	5.5	3.8	1.1
Middle	4.2	1.3	0
Downstream	0.5	0	0

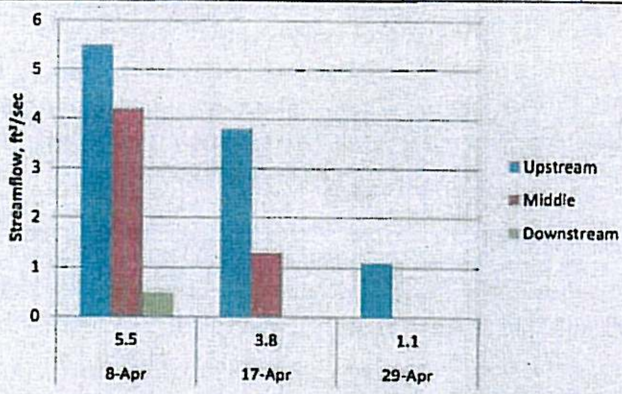
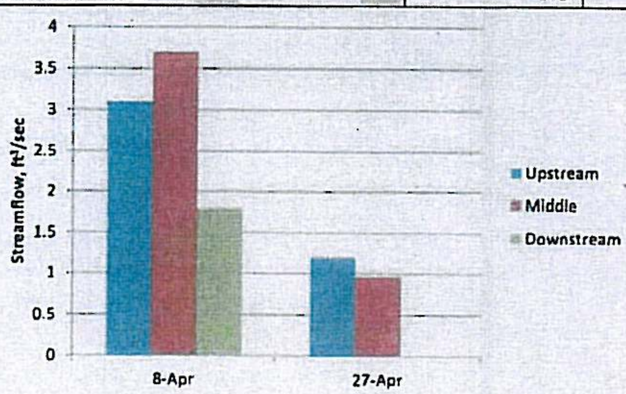


Table 2. Gird Creek Flow Measurement at three locations (over a 6500 ft distance).

Sample Date	4/8/2011	4/29/2011
sub-reach		
Upstream	3.1	1.2
Middle	3.7	0.96
Downstream	1.8	0



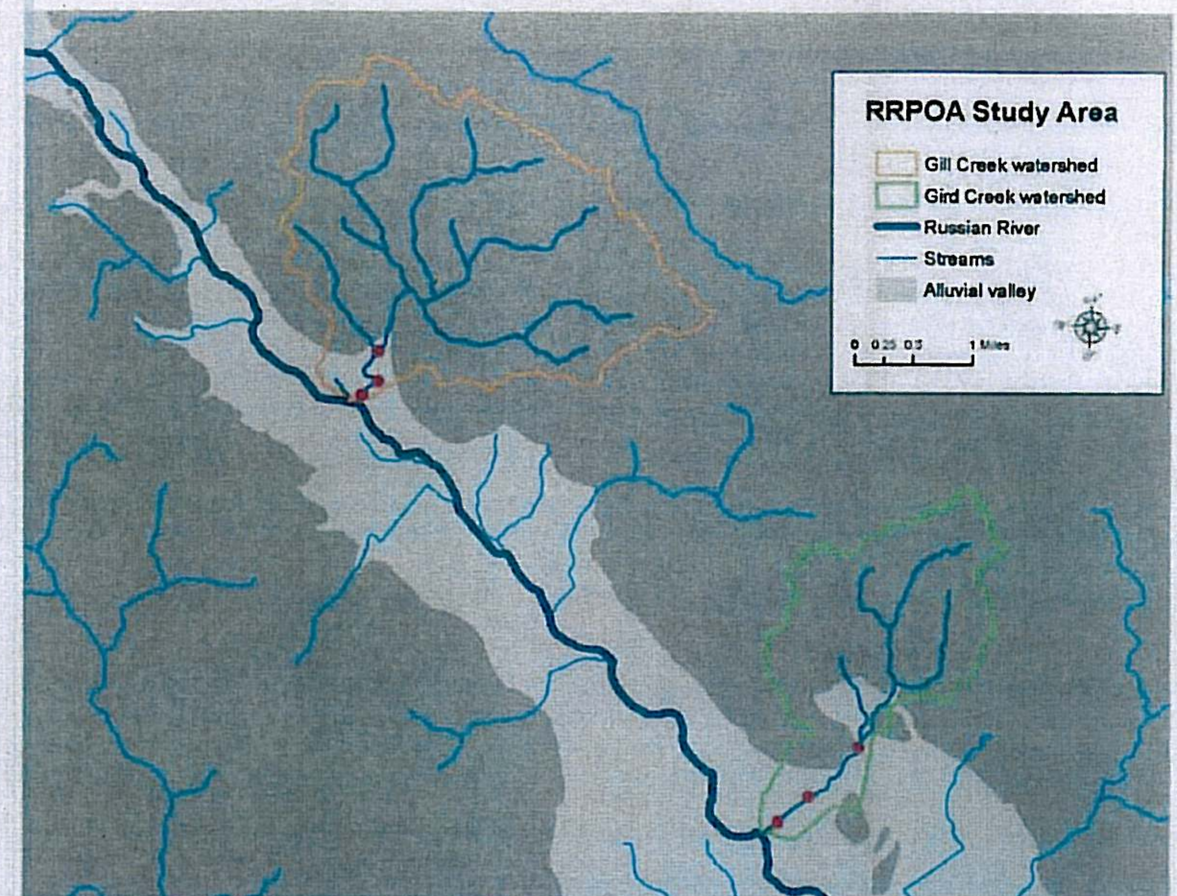


Figure 1. Gird Creek and Gill Creek watersheds and drainage network. Streamflow measuring sites are shown marked with pink dots.

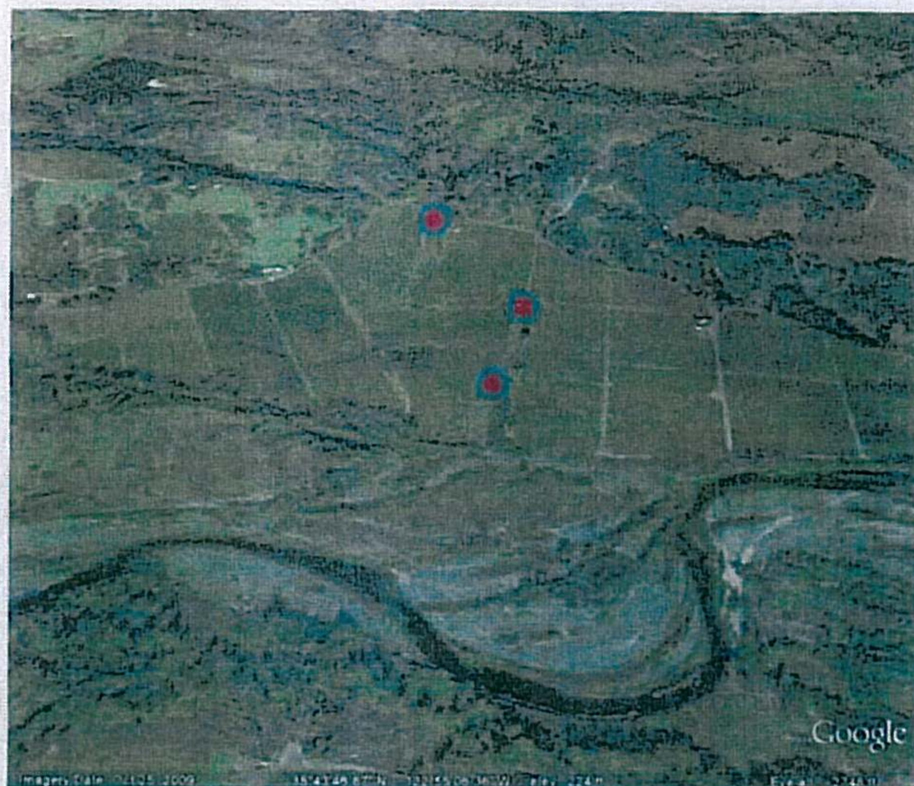


Figure 2. Upstream, Middle, and downstream streamflow monitoring sites, Gill Creek in Alexander Valley.

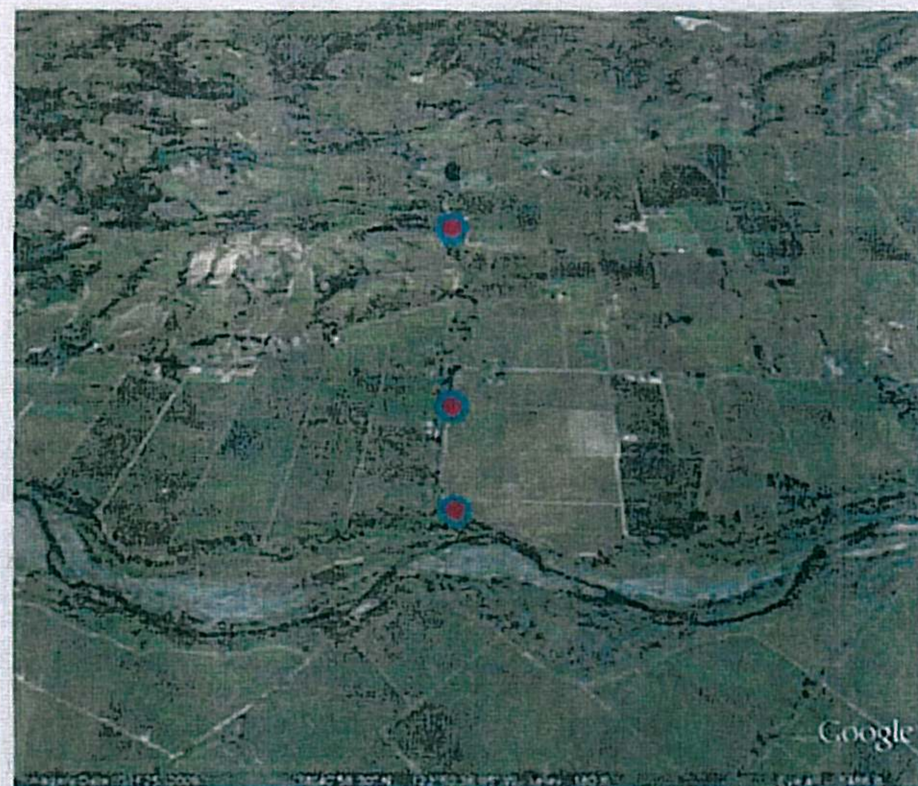


Figure 3. Upstream, Middle, and downstream streamflow monitoring sites, Gird Creek in Alexander Valley.

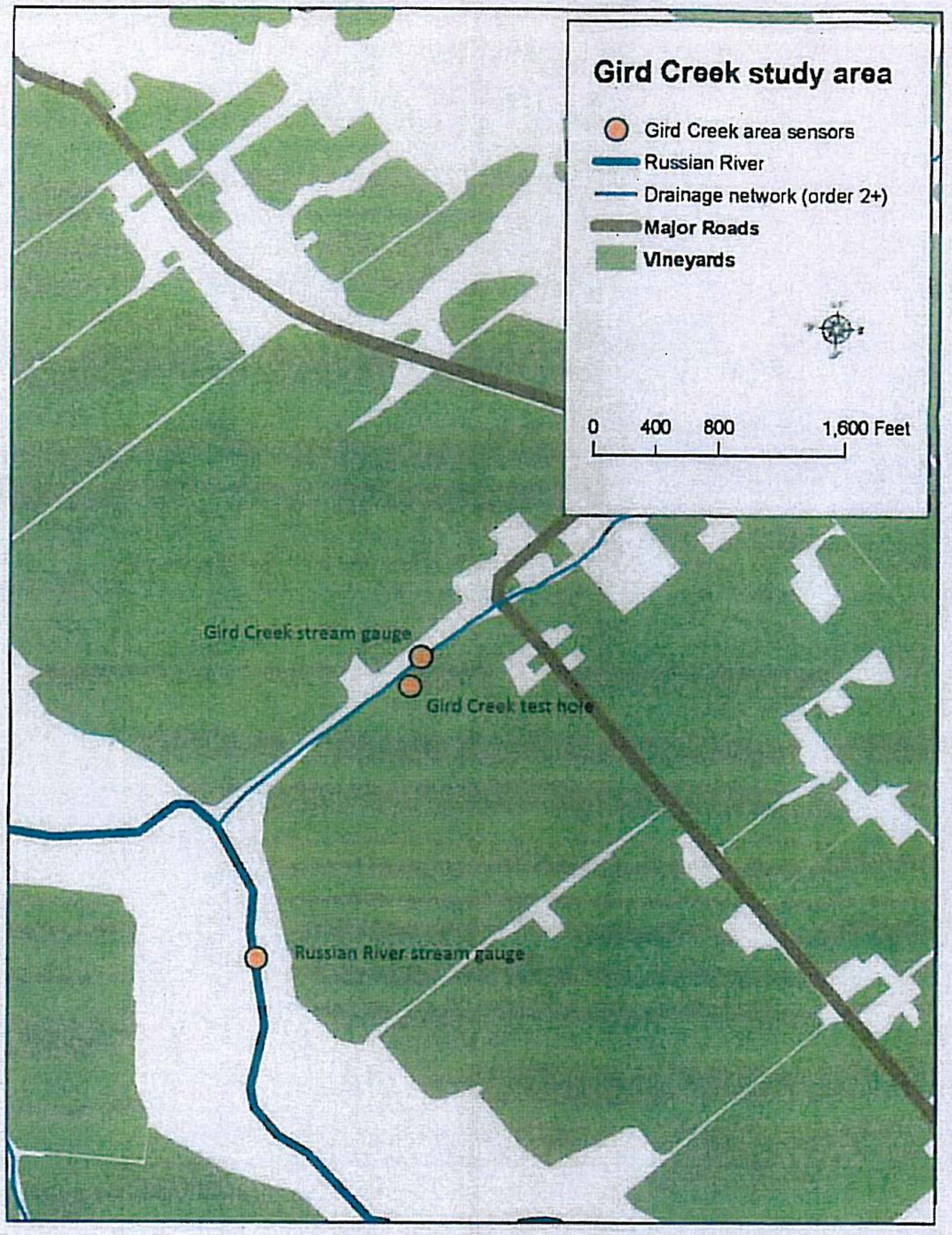


Figure 4. Water level and test hole gauges near Gird Creek, spring 2011.

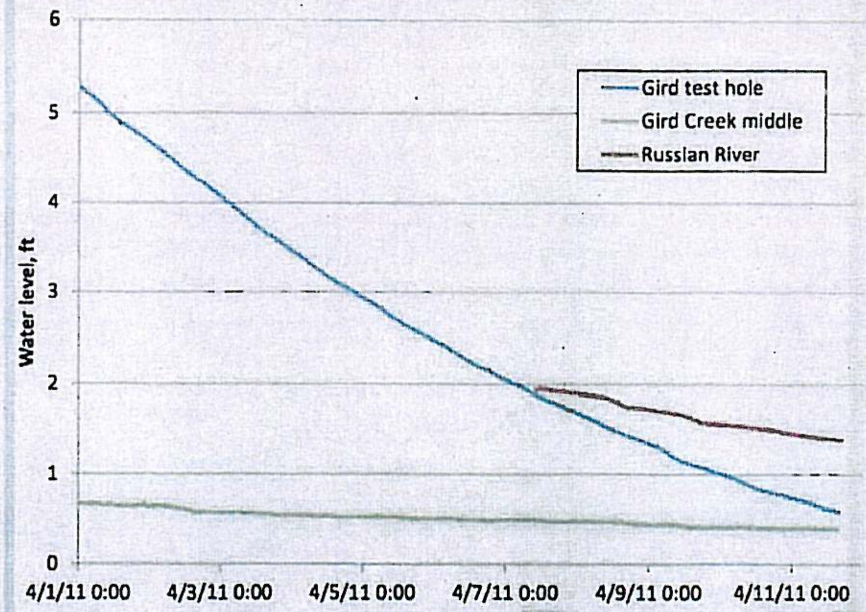


Figure 5. Water levels recorded at three locations in the Gird Creek study area, April 1 – April 11, 2011. Note that water levels are each individually arbitrary in space and are neither related to sea level elevations nor to levels among each other. (In these preliminary analyses, they only are intended to show magnitudes of change over time.)

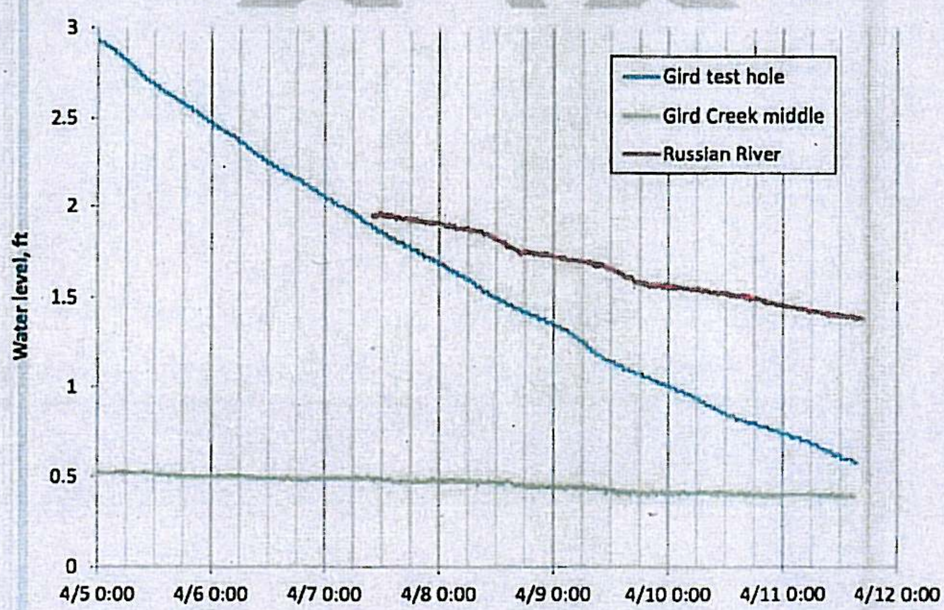


Figure 6. Water levels recorded at three locations in the Gird Creek study area, April 5 – April 11, 2011. Note that water levels are each individually arbitrary in space and are neither related to sea level elevations nor to levels among each other. (In these preliminary analyses, they only are intended to show magnitudes of change over time.)

Exhibit Q

Water Boards CIWQS

e-WRIMS Water Right Search Results

Criteria: Displaying Water Rights where Watershed is (Russian River).

Search Results: previous 1-50 of 1971 next

Appl ID	Permit ID	License ID	Water Right Type	Status	Holder Name	Date	Face Amt	County	Source	Permit/ License	Map It	Export to Excel
A001029	000482	000074	Appropriative	Licensed	JOSEPH IMWALLE	01/15/1920	95.5 acre-ft/yr	Sonoma	SANTA ROSA CREEK	View License	Map It	Download to Excel
A001205	000563	000086	Appropriative	Licensed	FULTON PROCESSORS INC	06/03/1920	343.6 acre-ft/yr	Sonoma	MARK WEST CREEK	View License	Map It	Download to Excel
A001665	000755	000290	Appropriative	Licensed	RICHARD J KETTLEWELL	02/10/1920	45.5 acre-ft/yr	Sonoma	FRANZ CREEK	View License	Map It	Download to Excel
A001983	000911	000424	Appropriative	Licensed	NORGARD PROPERTIES INC	08/26/1920	369.2 acre-ft/yr	Mendocino	RUSSIAN RIVER	View License	Map It	Download to Excel
A002723	001322	000566	Appropriative	Licensed	MARY C RIFFLE	01/24/1927	46.7 acre-ft/yr	Mendocino	WEST FORK RUSSIAN RIVER	View License	Map It	Download to Excel
A002928	001230	000407	Appropriative	Licensed	F MILTON & MARY P BRANDT REVOCABLE LIVING TRUST	07/14/1922	18.3 acre-ft/yr	Sonoma	RUSSIAN RIVER	View License	Map It	Download to Excel
A003291	001505	000528	Appropriative	Revoked		08/04/2004	0 acre-ft/yr	Sonoma	UNST	View License	Map It	Download to Excel
A003402	001530	000479	Appropriative	Licensed	L D SUTHERLAND	05/07/1923	23.3 acre-ft/yr	Mendocino	WEST FORK RUSSIAN RIVER	View License	Map It	Download to Excel
A003421	001708	000588	Appropriative	Licensed	STERLING NORGARD	05/16/1923	118.9 acre-ft/yr	Mendocino	UNXX	View License	Map It	Download to Excel
A003565	001710	001356	Appropriative	Licensed	Kenneth C. Wilson	08/03/1923	128.3 acre-ft/yr	Mendocino	RUSSIAN RIVER	View License	Map It	Download to Excel
A003601	001711	000492	Appropriative	Licensed	MILLVIEW COUNTY WATER DISTRICT	08/20/1923	27.1 acre-ft/yr	Mendocino	RUSSIAN RIVER	View License	Map It	Download to Excel
A003633	001729	000704	Appropriative	Licensed	WESTSIDE GRAPES LLC	04/18/1928	182 acre-ft/yr	Sonoma	RUSSIAN RIVER	View License	Map It	Download to Excel
A004307	002144	000683	Appropriative	Licensed	WILLIAM T JOHNSON	03/30/1928	67.8 acre-ft/yr	Mendocino	WEST FORK RUSSIAN RIVER	View License	Map It	Download to Excel
A004308	002145	000878	Appropriative	Licensed	BECKSTOFFER VINEYARDS XI	04/13/1988	91.3 acre-ft/yr	Mendocino	RUSSIAN RIVER	View License	Map It	Download to Excel
A004428	002157	001492	Appropriative	Revoked	PETER D BARRA	07/23/2008	125 acre-ft/yr	Mendocino	WEST FORK RUSSIAN RIVER	View License	Map It	Download to Excel
A004612	002427	000780	Appropriative	Licensed	JILL RIDDER	11/07/1930	41.5 acre-ft/yr	Sonoma	MILL CREEK	View License	Map It	Download to Excel
A004832	002428	001598	Appropriative	Licensed	ALEX R THOMAS III	11/12/1925	36.5 acre-ft/yr	Mendocino	RUSSIAN RIVER	View License	Map It	Download to Excel
A006464	003431	002299	Appropriative	Licensed	WILLIAM MARION NEESE	10/21/1929	86.3 acre-ft/yr	Mendocino	WEST FORK RUSSIAN RIVER	View License	Map It	Download to Excel
A006642	003525	001213	Appropriative	Licensed	MORENO & COMPANY	04/16/1930	365 acre-ft/yr	Mendocino	FORSYTHE CREEK	View License	Map It	Download to Excel
A006805A	003649	002231A	Appropriative	Licensed	LAURA GERARD-SLOTTE	09/26/1930	15.2 acre-ft/yr	Mendocino	WEST FORK RUSSIAN RIVER	View License	Map It	Download to Excel
A006854	003676	001772	Appropriative	Licensed	Philip & Eloise Gannon Family, LLC	12/26/1930	29.4 acre-ft/yr	Mendocino	RUSSIAN RIVER	View License	Map It	Download to Excel
A006855	003677	001497	Appropriative	Licensed	JAMES D MILOVINA	12/26/1930	110.7 acre-ft/yr	Mendocino	RUSSIAN RIVER	View License	Map It	Download to Excel
A007006	003789	009393	Appropriative	Licensed	RUSSIAN RIVER COUNTY WATER DISTRICT	05/26/1970	28 acre-ft/yr	Sonoma	RUSSIAN RIVER, UNST	View License	Map It	Download to Excel
A008974	004964	002952	Appropriative	Licensed	VICTOR S TRIONE	05/17/1937	183.5 acre-ft/yr	Sonoma	RUSSIAN RIVER	View License	Map It	Download to Excel
A009746	005506	002502	Appropriative	Licensed	DAVID J HENRY JR	10/03/1939	0.3 acre-ft/yr	Sonoma	UNST	View License	Map It	Download to Excel
A009774	005636	003130	Appropriative	Licensed	SONOMA LAND TRUST	11/27/1939	0.1 acre-ft/yr	Sonoma	UNSP	View License	Map It	Download to Excel
A009832A	005537	003104A	Appropriative	Licensed	SALLIE A MUMFORD	02/22/1983	43.4 acre-ft/yr	Mendocino	WEST FORK RUSSIAN RIVER	View License	Map It	Download to Excel
A009832B	005537	003104B	Appropriative	Licensed	SIMON LIMITED PARTNERSHIP	02/22/1983	159.7 acre-ft/yr	Mendocino	WEST FORK RUSSIAN RIVER	View License	Map It	Download to Excel
A009891	005595	003456	Appropriative	Licensed	MARY E MATTHEWS	05/08/1940	403.6 acre-ft/yr	Mendocino	EAST FORK RUSSIAN RIVER	View License	Map It	Download to Excel
A009992	005661	002626	Appropriative	Licensed	BRADLEY HAHN	08/28/1940	0.3 acre-ft/yr	Sonoma	UNST	View License	Map It	Download to Excel
A010795	006264	003697	Appropriative	Licensed	GALLO GLASS INC	04/07/1944	365 acre-ft/yr	Sonoma	RUSSIAN RIVER	View License	Map It	Download to Excel
A010915	006366	003004	Appropriative	Licensed	MADELEINE SONE	11/15/1944	20 acre-ft/yr	Sonoma	S BR OF W FK ATASCADERO CREEK, SOUTH BRANCH OF WEST FORK ATASCADERO CREEK	View License	Map It	Download to Excel
A010976	006379	003208	Appropriative	Licensed	RIVER BEND VINEYARDS, LTD	02/08/1945	18.2 acre-ft/yr	Sonoma	RUSSIAN RIVER	View License	Map It	Download to Excel
A011315	006611	003102	Appropriative	Licensed	DENNIS M TUOHY	03/13/1946	30.9 acre-ft/yr	Sonoma	WEST FORK ATASCADERO CREEK	View License	Map It	Download to Excel
A011327	006656	003344	Appropriative	Licensed	THOMAS R PASSALACQUA	01/28/1952	6.4 acre-ft/yr	Sonoma	MILL CREEK	View License	Map It	Download to Excel
A011383	006628	003225	Appropriative	Licensed	WILLIAM C PAULI	04/23/1946	667.8 acre-ft/yr	Mendocino	EAST FORK RUSSIAN RIVER	View License	Map It	Download to Excel

EXHIBIT Q

A011769	006883	006356	Appropriative	Revoked		10/26/2001	0 acre-ft/yr	Sonoma	LAGUNA DE SANTA ROSA	View License	Map It	Download to Excel
A011846	006957	003411	Appropriative	Licensed	KENNETH C WILSON	04/28/1947	106.2 acre-ft/yr	Sonoma	RUSSIAN RIVER	View License	Map It	Download to Excel
A011859	006942	003394	Appropriative	Licensed	MERNER LUMBER COMPANY	05/07/1947	7.1 acre-ft/yr	Sonoma	UNST	View License	Map It	Download to Excel
A011896	006885	004693	Appropriative	Revoked		03/03/2006	0 acre-ft/yr	Sonoma	MARK WEST CREEK	View License	Map It	Download to Excel
A012100	007118	007950	Appropriative	Licensed	ROBERT YAHNG	09/22/1947	11 acre-ft/yr	Sonoma	UNST	View License	Map It	Download to Excel
A012193	007208	005168	Appropriative	Revoked		08/06/2002	0 acre-ft/yr	Sonoma	SALMON CREEK	View License	Map It	Download to Excel
A012210	007209	003532	Appropriative	Licensed	ROBERT Y MIYASHIRO	12/24/1947	2.2 acre-ft/yr	Sonoma	UNSP	View License	Map It	Download to Excel
A012232	007094	003646	Appropriative	Licensed	FETZER VINEYARDS - BONTERRA RANCH	01/08/1948	96.5 acre-ft/yr	Mendocino	MCNAB CREEK	View License	Map It	Download to Excel
A012330	007189	003880	Appropriative	Licensed	DUTTON RANCH FAMILY LIMITED PARTNERSHIP	02/16/1948	105.5 acre-ft/yr	Sonoma	PURRINGTON CREEK	View License	Map It	Download to Excel
A012336	007301	005182	Appropriative	Licensed	CLINTON FOLGER	02/17/1948	5.1 acre-ft/yr	Sonoma	FELTA CREEK	View License	Map It	Download to Excel
A012452	007380	003647	Appropriative	Licensed	J L JORDAN COMPANY, A CALIFORNIA CORPORATION	03/29/1948	36.9 acre-ft/yr	Sonoma	RUSSIAN RIVER	View License	Map It	Download to Excel
A012483	007391	003650	Appropriative	Licensed	CITY OF SANTA ROSA	04/23/1948	131.6 acre-ft/yr	Sonoma	LAGUNA DE SANTA ROSA	View License	Map It	Download to Excel
A012510	007406	005461	Appropriative	Licensed	DENNER RANCHES, INC	05/14/1948	89.7 acre-ft/yr	Sonoma	LAGUNA DE SANTA ROSA	View License	Map It	Download to Excel
A012525	007326	003612	Appropriative	Licensed	ED KOZEL	05/27/1948	21.8 acre-ft/yr	Sonoma	MAACAMA CREEK	View License	Map It	Download to Excel

Return to Water Right Public Search Form

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Exhibit R

Center for Ecosystem Management and Restoration

April 6, 2011

Comments on the SWRCB frost protection regulation policy

In reviewing the SWRCB Proposed Regulations for frost protection water use and Rationale for the Proposed Regulatory Action, SWRCB staff cite studies and observations that connect instream diversions for frost protection with rapid declines in streamflow and fish mortality in the Russian River watershed. These observations are important for understanding the potential effects that instream diversions can have on streamflow during spring, when flows are already receding naturally.

It is important to recognize that these effects may not happen everywhere water is used for frost protection, and may not happen every time water is used for frost protection. As such, it is important that regulations do not apply a broad brush to prohibit use of water for frost protection. Rather, any actions should seek to maintain beneficial uses for agriculture as well as ensuring the preservation of streamflow by establishing through data collection where streamflow recession occurs as a result of frost protection water use. Continuous data collection and monitoring are necessary to establish whether changes in streamflow occur because of frost protection water use or because of natural streamflow recession with the onset of the dry season. Though the advocating for particular mechanisms to resolve documented recessions in streamflow from frost protection diversion between grape growers and regulatory agencies is beyond the objective of this letter, it is important that a framework is established to ensure that those changes in streamflow that do occur are addressed so that they do not occur in the future.

Matthew Deitch, Ph.D.

Senior Environmental Scientist

Center for Ecosystem Management and Restoration

EXHIBIT R

Exhibit S

Economic Impact of Frost Protection Regulation in California: Russian River Watershed

Final Draft

October 27, 2010

Robert Eyler, Principal

Economic Forensics and Analytics

PO Box 750641

Petaluma, CA 94975-0641

EXHIBIT S

About the Author

Robert Eyler is Professor and Chair of Economics at Sonoma State University in California. He earned a Ph.D. from the University of California, Davis in 1998. He earned a B.A. in Economics at CSU, Chico in 1992. He is the author of several academic and impact studies about the wine industry, specifically the lead author of *The Economic Impact of the California Wine Industry 2004* commissioned by the Wine Institute. Robert is the director of the Center for Regional Economic Analysis at Sonoma State University and has worked on multiple regional studies for Sonoma, Napa, Marin, and Mendocino counties. He has acted as an expert witness in interstate trade litigation, and as a forensic economist. He has also been a visiting scholar at both the University of Bologna and Stanford University. He is also the interim CEO of the Marin Economic Forum, a countywide, public-private partnership for economic development organization in Marin County. Robert's family has been farming in West Marin and Sonoma counties since 1910.

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Table of Figures and Tables

Executive Summary

This study concerns a new regulation that would restrict vineyards from using the Russian River as a source of frost protection water. Because thousands of vineyard acres in Sonoma and Mendocino counties use the Russian River, its tributaries and connected groundwater for frost protection, a regulation to restrict this water's use would affect the entire California economy. In a recent study by the Wine Institute, the economic impact of the California Wine industry was shown to be over $100 billion annually, of which Sonoma and Mendocino counties represent about 25 percent. This regulation would affect both wealth and income. Income would be lost due to reduced revenues and yield in vineyards, fewer employees, and decreased wages earned across the wine industry's distribution chain. Wealth would also be lost due to changing land values and a reduction in the return to capital investments, such as rootstock and current irrigation infrastructure.

This regulation would act like a tax on vineyard farmers, wineries and many allied industries, including tourism. The economic effects on wine vineyard farmers would include increased costs of frost protection, forcing investment in another frost protection method, such as wind. Wind or other frost-protection methods may be so much less effective that farmers could lose crops or even their livelihoods.

The Many Industries Affected

While this regulation may seem like a simple initiative to protect a natural habitat, the regulation would have far-reaching effects beyond vineyards. Wineries would be heavily

affected, in part because many wineries in Sonoma and Mendocino counties have vineyards. Industries such as glass companies, barrel coopers, trucking, docks, vineyard nurseries, hotels and restaurants, grocery stores, and many more are also affected. Approximately 900 jobs in industries unrelated to the wine industry in their everyday business would be lost because of this regulation. Over 8,000 jobs would be lost in these two counties in vineyard and winery businesses with just a 10% crop loss. Higher losses in crop production, such as during an advective type frost against which only water is effective, magnify job losses; over 26,000 jobs may be at stake if annual crop losses are 30% of their current levels.

Tax Revenue Lost

Regulation is meant to provide society with benefits, or to protect our natural environment against rising social costs. The social cost of this regulation outweighs its benefits. Over $142 million in annual local and state tax revenue would be lost due to this regulation, even when considering the positive mitigating effects of equipment sales and installations. Because the wine industry pays taxes throughout its distribution chain and is tied to a large amount of tourism that comes to the state of California, taxes such as transient occupancy tax (TOT) and sales taxes would be lost. There would also be millions in decreased tax revenue because of job losses and lost business revenues and associated profits.

Land Values Reduced

Land values would also fall as a result of this regulation. Sonoma and Mendocino counties are world-class, grape-growing regions. The land value is a major marketing input as well as in the correct geography to drive revenues and jobs for Californians. This regulation would increase the cost of using the land to its market-driven, best potential because it targets a specific use of water and a specific geography, which ultimately targets a specific type of business: small, vineyard farms that employ many workers at medium to low wages. As farmers attempt to reduce their property tax bill to reduce costs, there is a further social cost of this regulation. This report, using a 10% crop loss assumption, estimates over $113 million in lost land values over the next five years in Sonoma and Mendocino counties, which would compound the devastating effects of a recession that has not ended. With the complete prohibition of the use of frost protection water, the losses in land value could easily exceed $340 million.

The Costs Overall

The regulation could cost California over $2.1 billion in lost business revenues annually, as well as over $143 million in annual tax revenue lost to local governments and Sacramento, assuming 10% crop losses. If crop losses reach 30%, the losses would total over $6.7 billion in business revenues and $450 million in taxes. These estimates, based upon a 10% crop loss, include the mitigation of all farmers converting from frost-protection water to frost-protection wind, and paying full price for wind and monitoring equipment. If the crop or business losses are more significant, the mitigation is smaller and the costs rise further. Land values that are already in freefall from the real estate bubble bursting will fall further specific to vineyard land. Table EX - 1 summarizes the economic impacts of a 10% crop loss; Table EX-2 summarizes the economic impacts of a 30% crop loss. If there were 30% reduction in yields due to the regulation, the losses would be approximately three times the 10% losses, assuming the allied industries in these counties were able to remain stable in the face of these losses.

Table EX-1: Sonoma and Mendocino Economic Impact from Regulation, 10% Crop Loss

Category	Lost Jobs	Lost Business Income (Annual)	Lost State and Local Taxes (Annual)
Due to Vineyard Losses	948	$106,010,648	$2,867,744
Due to Winery Losses	7,391	2,098,294,381	141,047,166
Due to Tourism Losses	384	44,992,730	2,959,372
Due to Allied Industries Losses	524	51,425,678	3,578,438
Mitigation* (Wind/Monitoring Equipment)	+1,110	+173,951,579	+7,435,770
Totals (lost jobs and annual $)	8,137	$2,126,771,858	$143,016,950
		Lost Value	Lost Property Taxes
Lost Land Value		$113,697,867	$1,250,677

***Assumes no farmers go out of business before they convert frost protection to wind**

Table EX-2: Sonoma and Mendocino Economic Impact from Regulation, 30% Crop Loss

Category	Lost Jobs	Lost Business Income (Annual)	Lost State and Local Taxes (Annual)
Due to Vineyard Losses	2,845	$318,031,943	$16,617,905
Due to Winery Losses	22,174	6,294,883,144	423,141,499
Due to Tourism Losses	1,154	$134,978,190	$8,878,116
Due to Allied Industries Losses	1,573	154,277,034	10,735,314
Mitigation* (Wind/Monitoring Equipment)	+1,110	+173,951,579	+7,435,770
Totals (lost jobs and annual $)	26,637	$6,728,218,732	$451,937,064
		Lost Value	Lost Property Taxes
Lost Land Value		$341,094,000	$3,752,000

***Assumes no farmers go out of business before they convert frost protection to wind**

Economic Impact of Frost Protection Regulation in California: Russian River Watershed

Introduction

This study concerns a proposed new regulation that would restrict the ability of vineyards and wineries from using the Russian River watershed as a source of frost protection water. In brief, the potential loss of special status salmonid species and their habitat is the driving force behind this regulation. Because thousands of vineyard acres in Northern California use the Russian River, its tributaries and connected groundwater for frost protection, a regulation to restrict this water's use would affect the entire California economy. In a recent study by the Wine Institute, the economic impact of the California Wine industry was shown to be over $100 billion annually, of which Sonoma and Mendocino counties represent about 25%. It is important to recognize that both income and wealth would be reduced by this regulation if it passes. Incomes would be lost due to reduced tonnage and yield and fewer employees across the distribution chain. Wealth would be lost due to changing land values and a reduction in the return to capital investments, such as rootstock and irrigation infrastructure.

This regulation would act like a tax on vineyard farmers, wineries and the wine industry. Economic impact studies begin with the directly affected industries. For vineyard farmers, there would be increased costs of frost protection. Farmers would have to potentially remove current capital used for frost protection, if different from other irrigation, at some cost. An associated increase in costs would be the investment in another frost protection method. In some cases, wind and other frost protection methods will be less effective or totally ineffective such that a farmer will no longer have a viable grape crop or business. Those farmers that can afford to make a frost protection capital switch, and for whom the new method is effective, may be unable to afford as many workers; thus the number of jobs and incomes for vineyard workers are reduced as a direct effect. Also, vineyard land will decline in value due to a reduced viability of vineyard and reduced yields from a change in frost protection methods. These direct effects lead to indirect and induced effects that spread across all of California, from reduced trucking and logistics jobs, to fewer sales people for wineries with reduced winegrape availability, to lower revenues from retail wine sales.

Applying this regulation only to the Russian River watershed would not keep the economic effects from being statewide. The State Water Resources Control Board staff (SWRCB) proposes to include in the regulation the entire Russian River stem, all of its tributaries, and also what it considers to be "closely connected groundwater." Any mandated change in how a farm runs acts like a new tax. Farmers would have a cost imposed upon them based on the new regulation, and that cost would be partially passed on to the winery and consumer. Lost net revenue (both reduced revenue and increased costs) to farmers triggers larger, widespread effects on the California economy; the direct effects will be in the Sonoma, Mendocino and Napa county economies (the sum of reduced revenue and increased costs to growers). The larger effects include lost jobs, incomes, and tax revenues. This study's objectives are to:

- Describe the regulation and its economic effects on vineyard owners and California's economy;
- Describe the limits of other frost protection methods and a range of lost net revenue in cases where temperature inversion makes a wind machine and other methods less effective or completely ineffective;

- Describe briefly the other methods currently employed in the Russian River Watershed vineyards and their average costs;
- Estimate the proposed regulation's net revenue effects as a mandated increase in the cost to vineyard owners to switch from water-based frost protection to other methods;
- Estimate the farm value of lost crops from a freeze that non-water protection cannot mitigate;
- Estimate the lost net revenue as a result of grape shortages affecting the supply chain (wineries, retailers, restaurants) throughout California;
- Estimate the tax impact on Sonoma and Mendocino Counties and also California from a reduced amount of wine sold, reduced land values, and reduced sales and use taxes from the winery through the supply chain;
- Estimate lost land value from the vineyard land becoming less viable as vineyard due to frost protection restrictions and the lack of an alternative market for the land, much of which is in a flood plain;
- Estimate the tourism impacts on Sonoma and Mendocino Counties and also California from reduced wine production and the loss of vineyards and wineries due to increased costs in frost protection, loss of Russian River grapes and wine, and a lack of suitable alternatives;
- Provide a specific impact analysis on small businesses, specifically vineyards and wineries with fewer than 50 employees (which constitutes most of the wineries in the affected counties);

- Conduct the larger economic impact analysis on the California economy, where the purchase of new frost protection devices and services acts as a mitigating factor in the overall losses; and
- Provide conclusions and policy recommendations.

The Regulation and its Economic Effects

The regulation is a reaction to two alleged strandings of salmonid fish protected under the Endangered Species Act in the Russian River Valley. Regulators claimed that when vineyard owners turned their pumps on at the same time during a frost event, that it resulted in an instantaneous drop in water elevation in the Russian River, or its tributaries, that stranded these fish in small pools incapable of sustaining fish life. To address this, the original draft of the regulation declares that all "significant" diversions of water from the Russian River stream system, including "closely connected groundwater," for purposes of frost protection shall be considered to be unreasonable and a violation of law, unless the water is diverted pursuant to a SWRCB approved water management program. The SWRCB goes on to define "significant" as any diversion of water, unless the diverter can establish to the satisfaction of the SWRCB the diversion will have a "negligible" impact on river flows.

Thus, upon passage of this regulation, all diversions of surface water from the Russian River stream system, and groundwater near the Russian River stream system, for purposes of frost protection will become illegal. The only way to continue to divert surface water or groundwater for purposes of frost protection will be to participate in a SWRCB "approved" but otherwise undefined "water demand management program."

The regulation has been criticized as overbroad and ill-defined as it issues a complete prohibition on using water for frost protection unless and until a water management program is approved by the SWRCB. No assurances are given when the SWRCB might approve such a program, or even what the required components of a program might be, other than it must provide monitoring and reporting data on water diversions and stream flow every hour to the SWRCB. Thus, it is entirely possible it could take years for the SWRCB to better define, approve, and supervise a program. The only way out of the regulation is to prove to the SWRCB that a diversion has a "negligible" impact on flows, which term is equally undefined in the regulation and which could take years for the SWRCB to resolve.

Even if it does not take years to resolve these questions, the proposed water management system's costs would inevitably fall in the form of supplemental taxes on landowners who are assumed to be users. The draft regulation does not differentiate between those that have reservoirs and those that do not, nor does it target specific sections of the Russian River where water diversions are most likely to be detrimental to fish habitats. In fact, this regulation may affect landowners and firms far beyond the Russian River flow due to its large watershed. The numbers of acres that are frost protected in Mendocino and Sonoma County are significant: 17,194 acres in Mendocino County (which accounts for all their planted acreage), and 13,858 acres in Sonoma County based on a recent Sonoma County Farm Bureau survey. If 10% of vineyard farm revenue was lost due to the regulation and the cost of the regulation fell completely on the vineyard farmers as private firms, the following costs would be only the beginning of the economic effects of the regulation:

- One-time cost to install water meters at each Russian River diversion
- One-time cost to include satellite telemetry for each water meter
- One-time cost to install flow gages and telemetry stages on all major and minor tributaries
- Annual maintenance and debt service cost of monitoring system
- Debt service and one-time costs of purchasing and installing wind machines to reduce water demand for frost protection
- Lost revenue (estimated as 10% of five-year average in Sonoma and Mendocino counties) to vineyard farms due to conversion from frost protection water to wind
- Similar estimates for 30% losses in years with advective frost events or farms where wind is partially effective.

The Economic Effects of the Regulation to the Wine Industry

Though Sonoma and Mendocino Counties would be the epicenter of this regulation's effects, the costs on other industries directly allied with the wine industry would be significant[1]. Categorically, this regulation has three levels of direct economic effects on the wine industry:

- Vineyard farms, farmers and employees
- Winery businesses and employees
- Allied industry businesses and employees as identified in other studies.

Because of the three-tier system of distribution in California (as in most US States), fewer winegrapes harvested would likely increase wine prices to retailers and restaurants. Consumers that do continue to buy California wine will experience a "deadweight loss", where the regulation (because it really means a larger cost of final goods due to a larger cost of inputs

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[1] The Wine Institute's "Economic Impact of the California Wine Industry" from 2000, 2004, and 2007 identify specific industries that have a portion of their business dependent upon the wine industry. As a result, if the wine industry were to contract by any amount, these allied businesses, including tourism in Sonoma and Mendocino counties would also lose revenue, jobs and contribute fewer taxes to local and state governments.

for producers artificially imposed by the government) acts like a tax. Foreign competition will be enhanced by this regulation of California wineries. Foreign wineries will not face the same cost as their California competitors and may take advantage of that as wines from Sonoma and Mendocino counties rise in price. At a time where competition is fierce and prices are falling due to a recession-driven slowdown in demand, this regulation would likely cause the failure of both vineyard and winery businesses based in California.

The net economic impacts of this regulation depend on the cost to vineyards in conforming to the restricted use or inability to use current frost protection methods. The next section provides a background on frost protection methods currently used, other methods available, and cost differentials. These cost differentials are the key to the economic impacts.

Sonoma and Mendocino Counties in California's Wine Industry

Most of the effects of this regulation are not on the farmers, landowners and businesses that will face new costs and reduced productivity. The effects will ripple into the greater California economy across many counties and most of the state. Sonoma and Mendocino represent a relatively large portion of the overall and premium wine industry in California. In terms of acreage, these counties represent approximately 15.7% of bearing and non-bearing acreage and over 26.5% of the current vineyard land values in California. Napa County vineyard land, for example, is approximately 9.6% of acreage and 24.1% of the land value in California. In combination, tables 1 and 2 show the acreage and approximate land values for vineyard land in California.

Table 1: Vineyard Acreage in California, 2009

County	2009 Acreage	% of total
San Joaquin	71,260	15.1%
Sonoma	**57,149**	**12.1%**
Napa	45,401	9.6%
Monterey	42,259	8.9%
Fresno	41,425	8.8%
Madera	36,495	7.7%
San Luis Obispo	30,258	6.4%
Kern	21,070	4.5%
Sacramento	19,645	4.2%
Santa Barbara	17,566	3.7%
Mendocino	**17,194**	**3.6%**
All Others	73,594	15.6%
California	**473,316**	**100%**

Source: National Ag Statistical Service (NASS)

Table 2: Approximate Vineyard Land Values

County	2009 Values ($000)	% of total
Napa	$ 1,348,880	24.2%
Sonoma	**1,297,135**	**23.2%**
San Luis Obispo	577,900	10.3%
Monterey	525,840	9.4%
San Joaquin	456,400	8.2%
Mendocino	**207,880**	**3.7%**
Santa Barbara	207,390	3.7%
Fresno	166,898	3.0%
Madera	97,070	1.7%
Kern	79,838	1.4%
Lake	51,150	0.9%
All others	285,534	5.1%
California	**$5,584,250**	**100%**

Source: Wine Institute and USDA

Crop Value and Links to Allied Industries

Since 2000, the Wine Institute has commissioned studies to estimate the impact of the wine industry on California's economy. There have been four in the series, where 2007 and 2009 were updates of the 2004 study specifically (the initial study was done in the year 2000). One of the main findings of these studies is the number of allied industries without which the California wine industry would not have as large an impact as was estimated in 2009: over $121 billion per year. The synergy that exists between vineyards and wineries drives gains because bottled wine is a value-added agricultural good that produces export income and drives tourism. The links to other industries do not stop with the allied industries; the economic impact of vineyards and wineries is felt throughout unrelated industries due to the spending done by the workers in these wine-based businesses. These indirect and induced impacts are shown as part of the economic impact analysis below.

For the vineyard owners, the value of grapes has been a driving force in profitability and stability of these farms. Table 3 shows the value of purchased grapes for Sonoma and Mendocino counties and summarizes the remainder of the state except for Napa County. These data come from the National Agricultural Statistical Service (NASS), but are in a slightly different form than the acreage reports[2]. In 2009, Mendocino represented 2.8% of the winegrape value in California, while Sonoma was 15.5% of California. Mendocino and Sonoma, Russian River watershed districts, generated more than $300 million in combined vineyard revenue in 2009.

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[2] The revenue data as reported for winegrape transactions are in "pricing districts", and not by county. For our purposes, the only difference is that Sonoma and Marin counties are combined, where Marin is an insignificant amount of this pricing district's data.

Table 3: Purchased Grape Crush Crop Value for Vineyards, 2000 – 2009, $000

Year	Mendo	Sonoma	Napa	All Other Counties	California
2000	$72,951,000	$272,609,000	$220,161,000	$1,000,053,000	$1,565,774,000
2001	74,611,000	269,815,000	231,665,000	916,751,000	1,492,841,000
2002	64,385,000	250,044,000	226,062,000	783,342,000	1,323,833,000
2003	54,601,000	200,599,000	225,287,000	754,411,000	1,234,898,000
2004	45,949,000	208,729,000	211,456,000	847,461,000	1,313,595,000
2005	53,500,000	276,319,000	298,096,000	1,156,264,000	1,784,179,000
2006	62,235,000	272,789,000	245,433,000	928,945,000	1,509,403,000
2007	54,934,000	268,137,000	252,901,000	967,963,000	1,543,935,000
2008	46,971,000	247,824,000	224,548,000	1,072,383,000	1,591,725,000
2009	$53,234,000	$293,864,000	$262,867,000	$1,281,124,000	$1,891,089,000

Source: NASS, 2010

In terms of jobs, the following tables and charts provide an overview of comparisons and data for the vineyard and wine industry in California. The important idea here is in Table 4, which provides the number of allied industry jobs in California from the Wine Institute studies. Those employment figures, along with the updated figures for vineyard, winery and tourism jobs specifically, provide the data to demonstrate the greater impacts to California's economy as a result of this regulation. The Wine Institute studies assume that if the wine industry did not exist in California, these industries would lose these jobs because they would not have the California wine industry to service. The proposed regulation's impact on tourism will be covered in later analysis.

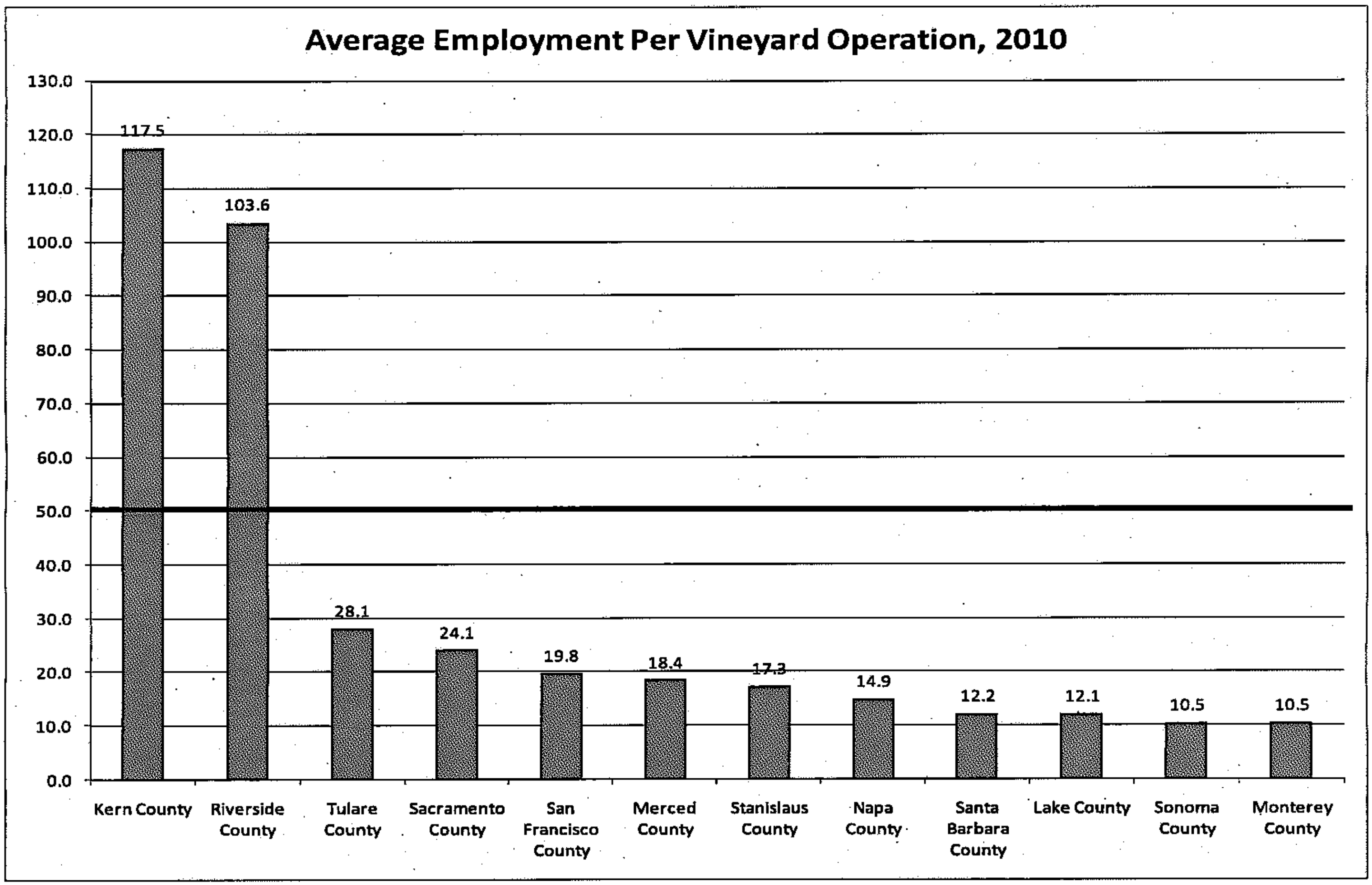
Table 4: Allied Industries and 2009 Job Estimates, California

Sector	Est. 2009
Boxes/Inserts and Bags	747
Cooperage	201
Corks/Caps/Screwtops	49
Distributor	2,487
Education and Research	80
Glass Bottles	1,245
Labels	1,210
Grapevine Nurseries	1,006
Grapevine Assessments	22
Retail/Liquor/Grocery	16,381
Restaurants	43,830
Stainless Steel	250
Trucking	3,253
Vineyard Development	15,793
Vineyard Materials	871
Warehousing	1,120
Wine Labs	52
Winery Tourism	28,877

Sources: Wine Institute, Economic Forensics and Analytics (EFA)

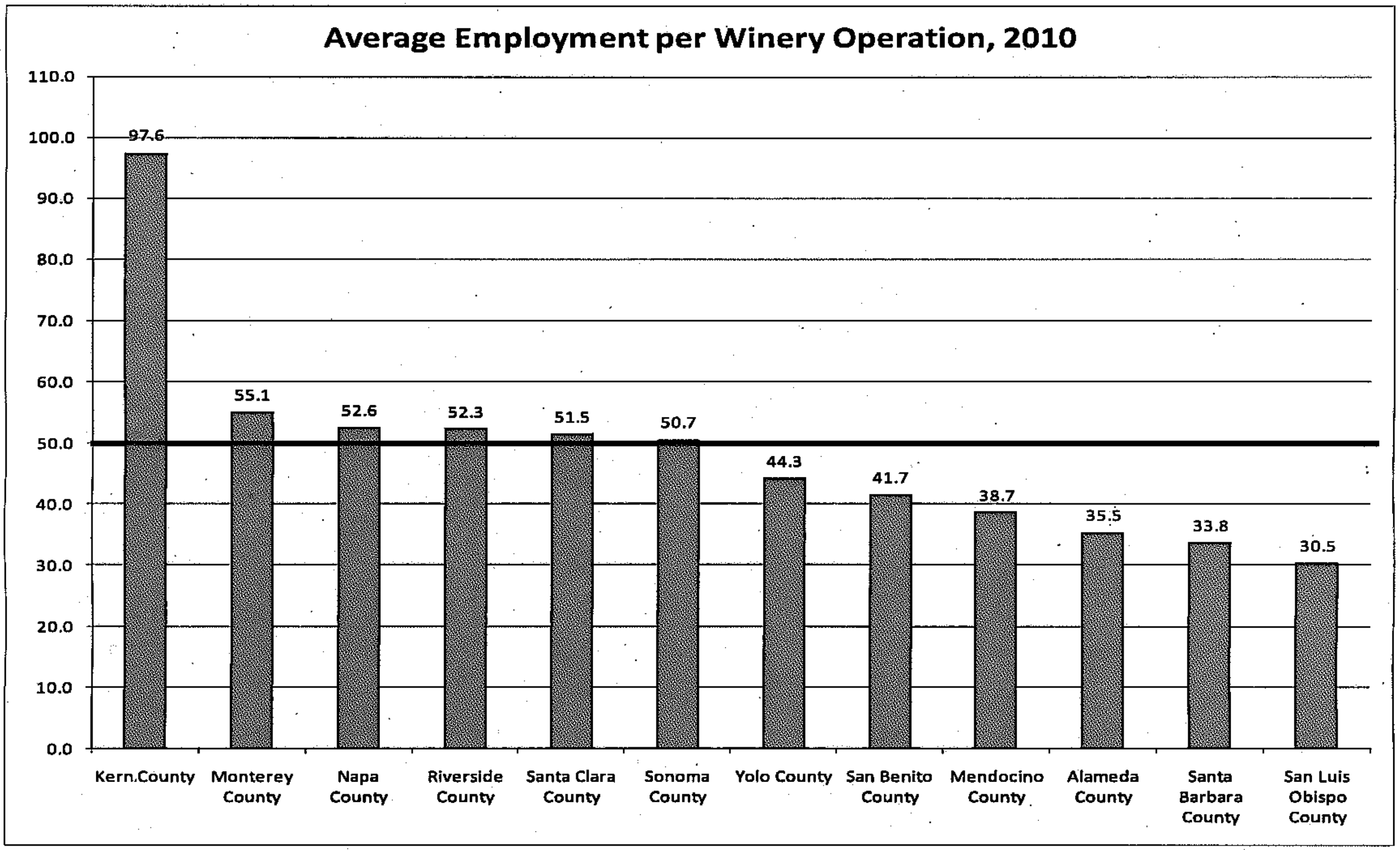
Figures 1 and 2 summarize the employment levels and proportions of total industry employment in California and its major wine-producing counties. The recent recession has caused some contractions in both vineyard and winery employment. We should think of vineyard farms and wineries in these counties as small businesses on average; this regulation would affect those businesses directly and their ability to remain viable, going concerns. A small business is generally seen as a business with fewer than 50 employees.

Figure 1



Sources: EFA and Census Bureau

Figure 2



Sources: EFA and Census Bureau

Frost Protection Methods and Vineyards in California

Frost protection is essential for vineyard management. While vineyards lie dormant during the winter months, they are protected from frost destroying the rootstock, buds and structure through water. There are other methods to protect against frost, such as wind and heat. Conversion to wind and heat methods require relatively large capital costs (heat also has high operation costs for fuel) to vineyard owners and farmers, specifically the capital purchase and the installation. We assume that frost protection with water is used because over time, farmers recognize that wind and heat are not as economically viable as water-based protection, especially in valley floors that are the coldest. This is especially true in Mendocino County, which is typically cooler than Sonoma County. This study will focus on wind due to its use in Sonoma and Mendocino counties already, and its known efficiency versus other methods beyond water.

A recent survey by Sonoma County Farm Bureau (2009) provides insight as to the amount of land in Sonoma County that is currently frost protected. We will assume that all vineyards in Mendocino County are frost protected. There are approximately 13,858 acres subject to conversion in Sonoma County (Barton, pers. comm., 2010) and 17,194 acres in Mendocino County (NASS, 2010). We will assume that the total amount of acreage that would need to be converted to non-water frost protection is at a minimum 31,052 (13,858 + 17,194). Of Sonoma County's vineyards, there were 3,807 acres using wind machines in 2008 (Sonoma County Farm Bureau, 2009).

Frost Protection Methods in the Russian River Watershed

These figures include bearing and non-bearing acres, as the assumption is that non-bearing acres that are planted likely have frost protection at some percentage close to the average of Sonoma County farms. Wind is the most common frost-protection method not using water. A good description of other methods beyond wind is McGourty and Smith (2009). Other methods include:

- Heaters
- Pond Construction and Use
- Well Construction and Use
- Bonfires: leads to smoke that creates an inversion layer
- Forced cold air displacement
- Frost Fan (quasi-wind, but different)
- Helicopters
- Thermal Blankets
- Poly Hoop Covers
- Site Change
- Ice-Nucleating Bacteria
- Chemical Sprays

Many vineyard owners in Mendocino County have implemented Best Management Practices (BMPs), such as constructing ponds, to address the concerns about Russian River water diversions during the frost season. The idea behind building ponds was that rather than directly diverting from a stream and potentially reducing the water available for fish during the frost season, the vineyard owners would divert water from a reservoir that had been filled before the frost season. These actions have attempted to reduce the impact of frost protection on salmonid species and increase the water available to farmers in the form of reservoirs. A recent report, prepared as a response and description of BMPs to the State Water Resources

Control Board, discusses at length the current state and planned construction and resources for ponds in Mendocino County as well as other types of BMPs. URSA (2009) provides a survey of current construction locations and costs (Ibid. page 17, Table 1), as well as actions to be taken through 2014 (Ibid. pages 19-21). A "Frost Task Force" has been assembled as a consortium of the California Land Stewardship Institute, Mendocino County Farm Bureau, and others to oversee this process. In short, this task force has the following objectives (Ibid. page 19):

- Complete an annual fish-friendly farming program enrollment and frost water conservation improvements and complete implementation of BMPs;
- Establish Science Advisory Group;
- Seek funding for Integrated Monitoring and Watershed Analysis for tributaries;
- Prepare detailed scope for Ukiah recycled water use feasibility study and seek funding; and
- Establish quarterly meetings with the Resource Agencies.

For this study, it is important to focus on the differential cost between the current frost protection method and the alternative protection method. There seem to be many choices from the previous page, but because wind machines already exist in Sonoma County, it is likely that growers forced to convert from frost-protection water would choose wind.[3] The typical wind machine installation has the following components and approximate costs, for a total of $32,871[4]:

[3] See Barton (2010) for a more detailed analysis of wind machine installation and operation.

[4] Ibid., page 8

- Parts and accessories ($28,171)
- Installation ($2,700)
- Assembly ($2,000)

The financing would be similar to that for a pond (assume a 10-year business loan at 7% percent interest), and each machine would cover approximately 12 acres per machine; estimated total costs for Sonoma and Mendocino counties for both installation and operation of new wind machines are listed in Table 5 and 6. A major assumption, which is unlikely to hold, is that Sonoma and Mendocino counties have topography that allows for wind to protect all acreage not currently protected by wind. This idea, including a coverage assumption of 12 acres per machine, makes these conservative calculations.

Table 5: Estimated Installation Costs for Wind Machines

Category	Sonoma	Mendocino
Farms	271	170
Cost per machine	$32,000	$32,000
Machines/acre	8.33%	8.33%
Acres to be Converted	13,858	17,194
Wind Machines Needed	1,155	1,432
Direct Cost	$36,954,667	$45,850,667
Debt Service (assume a 7% rate on capital)	**$2,587,597**	**$3,210,502**

Source: Barton (2010) and EFA

There is a lot of important data in Table 5, and one item that cannot be overlooked is the revenue for businesses that sell and install wind machines. The "Direct Cost" row in Table 5 represents this positive economic impact on the California economy as a result of this regulation[5]. However, much depends on the lending environment and who ultimately pays (i.e. the wine grape growers) for these changes. Tables 5 and 6 assume a 7% loan for 10 years as these are capital improvements rather than land or property improvements.

Table 6: Operational Cost Differential, Wind Machines and Water-Based Protection

	Sonoma	Mendocino
Farms	271	170
Per Acre Cost of Wind	$170	$300
Per Acre Cost of Water-based	36	36
Acres To be Converted	13,858	17,194
Annual Op Costs Wind	2,355,860	5,158,200
Annual Op Costs Water	498,888	618,984
Differential	**$ 1,856,972**	**$4,539,216**

Source: Barton (2010) and EFA

Water Diversions and Stream Monitoring Costs

Complying with this regulation would require measuring the water use and stream flows; there are costs for monitoring water diversions as well as how well the streams are supporting the salmonid species. The SWRCB estimated that 1,598 diversion meters would need to be installed to complete this process (Barton, pers. comm., 2010). In addition, according to Barton, each diversion meter has a purchase and installation cost of $8,857, and a $1,619/yr cost of operations (Barton, 2010). Further, there would be stream monitoring equipment for 31 "stations"; each station is estimated to cost approximately $15,000 to

[5] Tables 15 – 20 show the economic impacts of these new expenditures on companies that sell and install wind machines and related industries.

purchase and install, and another $13,000 annually to operate (Barton, pers. comm., 2010). The annual cost of this monitoring would be approximately $2,833,000 and $1,904,000 for Sonoma and Mendocino farmers respectively.

Vineyard Net Revenue Loss Estimate

The capital cost of new equipment and its installation reduces farmers' net revenues, but is also a gain for those companies that install and sell the equipment. As shown above, the costs per acre to install new equipment may be relatively large or small, but the fact that the farmer is mandated to spend that money forces higher costs on vineyard owners. The larger the vineyard, the larger the absolute cost; the relative cost depends, of course, on the efficiencies of the method(s) chosen. We will assume that the typical farmer will choose the most cost-effective method of frost protection with respect to the potential net revenue generation from that method's operation.

In addition to the costs of installing monitoring devices, monitoring streams and water diversions, and converting to non-water frost protection methods, farmers will bear the cost of any crops lost due to displacement of funding that historically would have supported labor and other capital to produce crop yields. As farmers pay to purchase and install these machines and monitoring devices, it is assumed they will reduce their workforce to remain in business. There is a possibility they may not be able to stay in business. The assumptions here will not argue the idea that wind machines will be less efficient than water-based frost protection, though there are suggestions that wind is less efficient; the key here is that the new costs borne by the industry will force vineyard farms to reduce their labor force and yields such that there is a further loss of net revenue which could even leave some farms non-viable. The range discussed below is if 10% to 30% of the historic crop yields are lost to the industry. These losses will begin a chain reaction throughout the industry, from wineries to other allied industries that magnify the effects of this regulation.

Lost crop yields lead to lost revenue for farmers; the lost net revenue to vineyard farms includes lower yields and the regulation's costs. There also needs to be recognition that every dollar lost to a farmer in revenue will not become a lost job. A portion of lost revenue will likely lead to lost jobs, as different farmers will have different cost structures. In summary, the estimated net revenue lost includes the estimated, additional cost of new frost protection methods, stream monitoring as well as lost revenue due to crop yield reductions.

Table 7 summarizes the estimated net revenue losses for farmers based on different crop loss scenarios, using 2009 revenues and that 25% of that loss would cover labor and not other expenses. This is a conservative estimate at 10%; if there were 30% reduction in yields due to the regulation, the losses would be approximately three times the 10% losses, assuming the allied industries in these counties were able to remain stable in the face of these losses. Table 7 provides the estimated net revenue reductions based on different crop loss scenarios. The figures are the beginning of the economic impact analysis below.

Table 7: Lost Vineyard Farm Net Revenue based on Crop Loss Scenarios

Lost Revenues	Sonoma	Mendocino
10% Crop Loss, 5 year avg.	$26,127,677	$5,280,375
30% Crop Loss, 5 year avg.	$78,383,031	$15,841,125

Note: Includes all annual, estimated costs of regulation (wind, meters) above

Change in Land Values

Another effect of this regulation would be the reduction of wealth for vineyard farmers. If we assume that vineyard land will be restricted from using water-based frost protection, and net revenues are reduced because of that mandate, the value of land either currently bearing grapes, or planted and not yet bearing, will decrease. What makes land valuation difficult is that there are many factors involved in such a calculation, including different harvest values for different varietals, other potential uses of vineyard land, and the water rights associated with that land. This regulation may change the value of land depending upon these variables. As land values fall due to lower profitability levels from the land, the owners have lower returns on both income and wealth. This slows the general expansion of the industry, which can exacerbate lower volumes and sales. The reduction in the land's value may change the amount of wine grapes harvested because if both net revenues and land values are falling, certain landowners will simply stop producing grapes and move to growing something else or even leave the land without any crop.

A simple way of estimating the profitability of land is to estimate the revenue it generates for farmers and then subtract the costs of operations. Because the regulation will have the effect of both reducing revenue and increasing operational costs, the profitability of the land (measured by net revenue before interest, depreciation, amortization and taxes) will be affected on both sides to the farmer's detriment.

Estimated Productivity Loss of Vineyard Land due to Regulation

Tables 8 through 12 use an analysis based on agricultural economics literature concerning farmers' reactions to lost net revenues, in terms of "elasticity" (see Volpe, et. al., 2010). The regulation would force new costs and lost sales onto farms; as net revenues fall in the short term, the effects are relatively small. Lost net revenue year after year, and an inability to reinvest as much in the business, makes land less valuable from both reduced productivity and in terms of lower return on investment. Note that there is no time frame associated with the short and long runs. The term "short run" refers to a time period in which the farmer's costs are a mix of fixed and variable elements; the term "long run" represents the ability of farmers to convert all costs to variable and remain viable. The inception of the long run could be 3 years or 30 years, but we will assume that the long run begins within 5 years.

The long-run effects are more devastating because farmers are making adjustments to survive, which means cutting labor and reducing production levels. Suppose there are initially (short-run) 10% crop losses in each of Sonoma and Mendocino counties as a result of the mandated changes to frost protection. Volpe, et al. (2010) uses a methodology that implies short-run and long-run adjustments are different to losses as farmers adjust their plantings, acreage and labor expenses.

Table 8: Estimated Lost Net Revenues from Regulation as % of Total Revenue

		10% Crop Loss	30% Crop Loss
Lost Revenues	Sonoma	$26,127,677	$78,383,031
	Mendocino	$5,280,375	$15,841,125
Total Value of Vineyard Yields	Sonoma	$293,863,975	$293,863,975
(From Table 3)	Mendocino	$53,233,883	$53,233,883
% Total Value Lost	Sonoma	8.90%	26.70%
	Mendocino	9.90%	29.70%

Note: "Total Value" is the 2009 revenue to wine grape farmers for the specific county

Table 9 shows how the percentage of net revenues lost has both short-run and long-run effects. Notice that in the short-run, a regulatory change is more easily absorbed by farmers than an unfunded mandate that is perpetual in nature. The multiplier in Table 9 connects farmer reactions to lost revenue; in the short-run, losses are assumed to be mitigated by farmers using efficiencies where they can. In the long run, farmers run out of options after successive years of losses. Within five years, almost one-half of vineyard revenue may be eliminated if crop losses are 30% for five years in a row from 2009 levels in both counties. Table 10 simply shows the dollar figures associated with these percentages by combining a five-year average of Table 3's total value figures and the percentage reductions in Table 9.

Table 9: Response of Vineyard Revenues to a Change in Average Net Revenues

	% Reduction (Table 8)		Multiplier SR	Multiplier LR	Short Run % Reduction		Long Run % Reduction	
Loss %	Sonoma	Mendo			Sonoma	Mendo	Sonoma	Mendo
10%	8.9%	9.9%	0.2	1.66	1.8%	2.0%	14.8%	16.5%
30%	26.7%	29.7%	0.2	1.66	5.4%	6.0%	44.4%	49.5%

Table 10: Estimated Annual Loss of Vineyard Land Values

		From Table 9 (% Reduction 10%	30%	Dollar Estimates of Annual Lost Value 10% Loss	30% Loss
Sonoma	SR	1.8%	5.4%	$5,308,008	$15,924,024
Mendo	SR	2.0%	6.0%	$1,072,743	$3,218,229
Sonoma	LR	14.8%	44.4%	$43,399,861	$130,199,583
Mendo	LR	16.5%	49.5%	$8,771,064	$26,313,192

The real estate market's pricing of vineyard land is difficult to determine fully, but revenue losses each year will slowly decay vineyard property values in each county. The present value of the sum of those annual losses provides an estimation of the real estate market's valuation change for vineyard lands. Based on Table 10's dollar losses, Tables 11 and 12 are based on short-run and long-run effects on farmer revenues; these figures represent the present value of annual losses as described in Table 10 over a five-year period. If seen as perpetual reductions in value, the overall lost land values are significantly larger.

Table 11: Estimated Loss of Land Values, 10% Crop Loss Scenario

Crop Loss %	Loss of Land Value	Land Value Loss	**Lost Property Taxes**
10%	Sonoma	$94,583,000	$1,040,000
10%	Mendocino	$19,115,000	$210,000
Total		$113,698,000	$1,251,000

Table 12: Estimated Loss of Land Values, 30% Crop Loss Scenario

Crop Loss %	Loss of Land Value	Land Value Loss	**Lost Property Taxes**
30%	Sonoma	$283,748,000	$3,121,000
30%	Mendocino	$57,345,000	$631,000
Total		$341,094,000	$3,752,000

The values in Tables 11 and 12 assume that property taxes are 1.1% of the assessed value of land; property taxes affect local governments, specifically education and public safety, more than state governments. Another level of impact comes from lost tax revenues specific to the wine industry, which is already a heavily regulated industry.

The Tax Impact on California's Governments

This regulation, which acts like a tax, affects an industry that already has multiple layers of compliance and taxation. Taxes in the wine industry are collected at the production, distribution/importation, and retail levels. This includes California Redemption Value (CRV) taxes on the containers, sales taxes, federal and state excise taxes, and production taxes. There are also lost tax revenues for local and state governments due to the multiplier effects of lost jobs, lost revenues on all business and household taxes, including lost property taxes, DMV fees, employment taxes, and income taxes. Below is a brief description of how the supply chain in the wine industry provides tax revenue for the state of California, and how the effects described above would reduce the overall tax revenue.

The Three-Tier Distribution System for Wine in California

The three-tier system of distribution that is mandated by the California government (as in many states) for moving alcohol from production or importation to retail is a holdover from the 21st Amendment to the U.S. Constitution that repealed the 18th Amendment concerning prohibition. California attempts to track any and all alcoholic beverages that are produced, distributed/imported and sold throughout the state and also those exported from California. The main economic reason for this is to collect taxes at each point on that chain. (There are taxes collected by the federal government as well.) In many ways, this three-tier system is in place to tax wine (and alcohol more generally) as an issue of assumed temperance and as a way to tax an assumed, inelastically demanded product.

There is also a connection between each of these tiers that is economic beyond the taxation. In many cases, wineries are vertically integrated along this chain which links decisions in the vineyards directly to decisions in the winery and by sales staff. For those wineries that are located where a tasting facility makes both economic and regional sense, there are also retail sales directly linked to the decisions in the vineyards. A regulatory change, such as the frost protection initiative, has effects far beyond the vineyard because of these connections.

The overall tax impacts of this regulation are estimated below, but there will be three levels of tax losses for government, and no real fiscal relief in terms of expense reduction (especially if stream monitoring becomes a government job and is not done by private concerns):

- Lost taxes specific to the production, sale and consumption of wine grapes and bottled wine (state and federal).
- Lost sales taxes (state).
- Lost property and TOT taxes due to lower land values and reduced tourism.

TOT stands for "Transient Occupancy Tax" or the tax levied on hotel stays, which acts like a sales tax specific to renting accommodations. The next section provides a background on tourism's links to the wine industry, where Sonoma and Mendocino counties are significant portions of California's tourism and hospitality industry around wine.

Tourism and the Wine Industry

Tourism industries are tied to the wine industry in California, especially in the Russian River Valley and Basin. Much of Sonoma County's and Napa County's economy is either directly or indirectly affiliated with the wine industry. Restaurants, hotels, limousine services, linen cleaners and suppliers, food service organizations, construction, landscaping, information technology--all have some connections, including branding. Sonoma County's tourism bureau now refers to the county as "Sonoma Country" where traveling to Sonoma County is seen as analogous to a passage to rural France or Italy among the vines.

The frost protection regulation would have multiplicative, focal effects on local tourism in these areas. Dean Runyan Associates publishes tourism statistics for all of California and each county for the state government. Further, the Wine Institute's study on the economic impact of wine on the California economy (2000-2009) provides a more detailed analysis specific to the wine industry. Table 13 uses data from both sources, as well as updating to provide a direct impact for the IMPLAN analysis below.

Table 13: Wine Industry Tourism Data, 2009 $ and Jobs

County	# of Wineries	Winery Tourists (thousands)	Winery Tourism Expenditures ($000)	Wine Tourism Payroll ($000)	Wine Tourism Employment (Jobs)	Local Taxes ($000)	State Taxes ($000)
Napa	711	8,455.26	$823,840	$90,312	9,550	$26,880	$28,960
Sonoma	**585**	**3,582.48**	**361,577**	**34,833**	**4,719**	**7,781**	**14,108**
San Luis Obispo	342	948.53	136,584	16,981	2,090	3,048	5,268
Santa Barbara	180	1,035.41	117,568	14,170	1,458	3,440	4,568
Mendocino	**109**	**398.82**	**84,075**	**16,433**	**1,500**	**1,950**	**3,075**
All Other Counties	1,032	2,571.77	316,947	44,806	9,453	7,098	12,817
California Totals	2,959	16,992.27	$1,840,591	$217,535	28,770	$50,197	$68,796
Sonoma and Mendo	**694**	**3,981.30**	**$445,652**	**$51,266**	**6,219**	**$9,731**	**17,183**

Source: Wine Institute, Dean Runyan Associates, and EFA

As can be seen by Table 13, Sonoma and Mendocino counties bring over $9 million in local taxes per year into their communities from winery tourism, almost 20% of the state total for local taxes derived from the wine industry's tourism activities in California. Generally, Sonoma and Mendocino counties provide between 20% and 25% of the total economic flows for winery-related tourism in this state. Within the state and local tax revenues are TOT taxes based on hotel stays and other overnight accommodations.

Vineyard Farms are Small Business

Small business can be defined in many ways. For this study, a small business is one with up to 50 employees; recent tax credits for small business use 50 employees as the maximum number to qualify[6]. As small businesses fail, so do many households. The key idea here is that the effects on the wine industry as a result of this regulation will fall squarely on small business; like any other tax, the incidence of this regulation will act regressively in terms of size. In this report, we will also use the number of acres of vineyard as a measure of small business, and for wineries the case volume acts as a measure of small business as well.

Vineyard Farms and Wineries as Small Businesses

While it is true that large wineries may also hold significant acreage, many large wineries may still purchase grapes from farmers with contracts and thus utilize smaller businesses for raw materials. In a similar way to any manufacturing process, wineries rely on both small and large firms to supply them with their raw materials. However, many wineries are also small businesses, where small businesses are defined as firms with 50 or fewer full-time employees. Figures 1 and 2 provide a comparison of average employment across vineyard farms in major wine-growing counties of California. Wineries are also chiefly small businesses in California. The wine industry, as with other agricultural products, was run by family-owned firms for most of the 20th century. Consolidation and financial crises have changed the landscape of wineries in the past twenty years. The size of wineries is mainly a function now of location; smaller wineries exist throughout northern California. Recent research (Cordano, et

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[6] See the Small Business Health Care Tax Credit for Small Employers. http://www.irs.gov/newsroom/article/0,,id=223666,00.html

al., 2010) suggests that 16% of wineries are family-owned, and 90% have fewer than 35 employees.

Economic Impact Analysis

Like a rock dropped into a pond, the regulation will produce effects on California in lost business revenues, lost jobs and reduced tax revenues. The IMPLAN®, which stands for IMpact analysis for PLANning, is a model by which municipalities and counties worldwide analyze the employment, business revenue and tax effects of economic events. In many cases, these models are used to explain and estimate the positive effects of new incomes or jobs. In this study, IMPLAN estimates the effects of net economic losses due to higher costs of frost protection as a cost of goods sold. There are three classifications of these effects. The **direct** effects are those that initiate the impacts. For example, the increase in frost protection costs, which may range from the purchase of new frost protection methods to a reduction of vineyards overall, increases the costs of producing wine grapes. This direct effect begins a chain reaction of higher prices and lost jobs, which generates direct effects on local employment, tax and business revenues.

Indirect effects come from directly-affected workers and businesses reducing their spending on other businesses' goods and services. This loss of revenue flow to other businesses leads to additional employment, revenue and tax losses indirectly caused by the initial event. For example, when a vineyard owner has an increase in costs (loss of income), the owner purchases fewer restaurant meals, office supplies, and other basics. The restaurants and office supply retailers lose income; as merchants' sales fall, they contract their employment base to reflect their reduced demand. These additional job and revenue losses create **induced effects**. The induced effects are similar to the indirect effects, but come from the indirectly-affected workers and firms and their spending on the local economy more broadly. For example, the office supply worker who loses her job due to a reduced demand for the office supply's goods and services reduces her demand of a broad range of personal services, retail products and other spending. Figure 3 provides a way to picture the economic impact process.

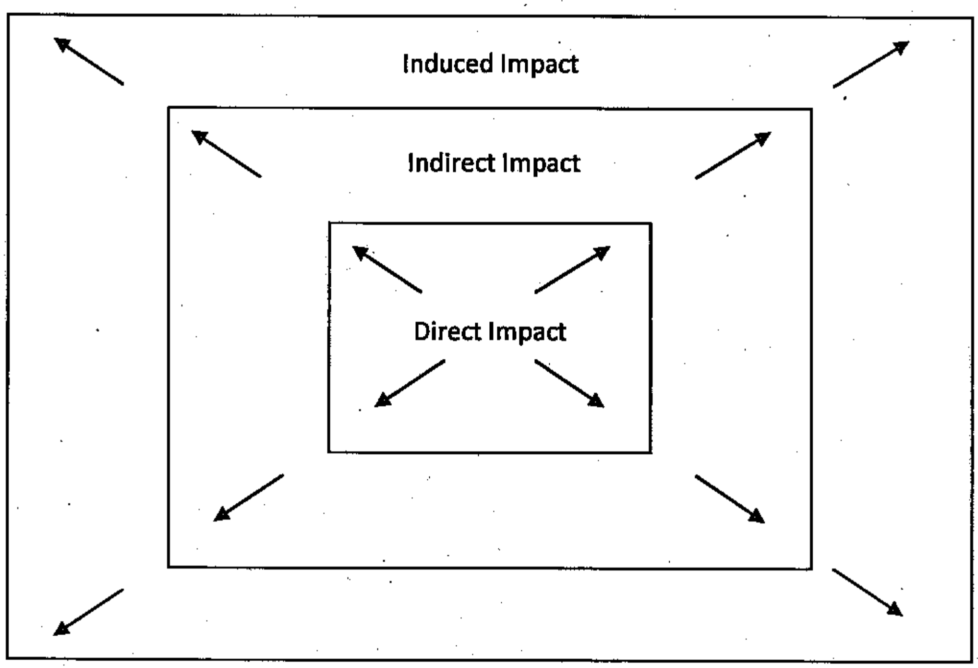
The sum of these direct, indirect, and induced effects is the total or overall economic impact of the original event. Because this regulation would have sequential effects--first the net effects of conversion to non-water frost protection, then the changes to operations based on these additional costs—the chain of events in calculating the overall economic impacts are described below.

Tables 21 to 26 provide the estimated economic impacts of this regulation on operations in vineyards and wineries in Sonoma and Mendocino counties, and then the effect on allied industries throughout California. It is important to realize that the net gains and losses from this regulation are statewide because of the breadth of effect that wine and winegrapes have on many industries throughout the state. Estimated job impacts are in terms of full-time equivalent employees.

Install/Conversion Costs, Benefits:

This regulation's economic effects would begin with the required conversion, for vineyards currently using water to protect against frost, to frost protection methods that do not divert water from the Russian River. The installation of this new capital, and the potential removal of current capital, has confounding effects because there are heightened business *costs* for vineyard owners, but also new business *revenues* generated by the sale and installation of this capital. Firms that specialize in wind machines, frost fans, and other frost protection methods will gain from this regulation in sales they receive from artificial marketing. Of course, those that own vineyard will either convert vineyards (and bear that cost) or potentially stop growing grapes.

Figure 3: Economic Impact Concept



Some assumptions are needed to make an estimate of these costs. The following list provides the assumptions for the estimated economic impact concerning lost revenues and labor from the regulation:

- There are one-time costs of installation and purchase of the wind machines, and the diversion and stream monitoring equipment.

- There are also one-time benefits to firms that both sell and install these wind machines and diversion and stream monitoring equipment.
- There are revenue losses to vineyard farms as a result of lower frost-protection efficiency, higher costs or both (assuming a 10% crop loss).
- There are specific losses in tourism, state and local taxes, and other allied industries based on 10% crop losses.
- There are losses to the value of vineyard land based on reduced profitability because of the regulation.

The links between vineyard workers and workers throughout the allied industries begin with the relationship between vineyard workers and winery workers. Recent Census Bureau data shows that there were 13,596 winery workers on average in Sonoma and Mendocino counties in 2009. There were 3,634 vineyard workers. We will assume a 3 to 1 ratio (instead of a 3.74:1 ratio which the data imply) as a conservative estimate of how vineyard jobs lost will trigger winery jobs lost if the genesis of vineyard jobs lost is lower tonnage (based upon the assumed 10% crop loss) in these counties.

Table 14: Vineyard and Winery Lost Workers, 10% and 30% Crop Loss Scenarios

	% Crop Loss	Year 1	Year 2	Year 3	Year 4	Year 5	**Average Vineyard**	**Average Winery**
Sonoma	10%	47.8	133.5	219.2	304.9	390.6	**219.2**	**657.6**
Mendocino	10%	9.7	27	44.3	61.6	78.9	**44.3**	**132.9**
Sonoma	30%	238.9	667.4	1,095.9	1,524.5	1,953.0	**1,095.9**	**3,287.8**
Mendocino	30%	48.3	134.9	221.5	308.1	394.7	**221.5**	**664.5**

There are also immediate positive economic impacts of these new sales to these companies in California; we assume that all sales will be to local and regional firms that specialize in sales and installation of these machines.

Table 15: Economic Impacts on Frost Protection Companies, New Business Revenue, 2010$

Industry	Direct	Indirect	Induced	Total
Wind Machine Firms	$82,805,248			$82,805,248
Architectural services		6,135,536	113,727	6,249,263
Petroleum refineries		4,945,840	942,782	5,888,622
Rental Income for Property Owners			4,980,224	4,980,224
Wholesale trade businesses		2,517,856	2,089,808	4,607,664
Real estate establishments		766,160	1,821,924	2,588,084
Food services and drinking places		333,300	1,672,468	2,005,768
Medical Offices		4	1,802,960	1,802,964
Private hospitals		5	1,492,844	1,492,849
Legal services		877,354	571,946	1,449,300
All Others		17,449,289	23,456,791	40,905,983
Total	$82,805,248	$33,025,344	$38,945,377	$154,775,969

Table 16: Economic Impacts on Frost Protection Companies, New Jobs

Industry	Direct	Indirect	Induced	Total
Construction	484.2			484.2
Landscape and vineyard design firms		43.7	0.8	44.5
Restaurants and bars		5.4	26.9	32.3
Wholesale trade businesses		12.1	10	22.1
Medical and Dental Offices			14.2	14.2
Employment services		9.8	4.3	14.1
Real estate establishments		4.1	9.9	14
Retail Stores		2.3	8.1	10.4
Private hospitals			10.3	10.3
Grocery Stores		2.2	8	10.2
All Others		89.3	160	249.3
Totals	484.2	168.9	252.5	905.6

Table 17: Economic Impacts on Monitoring Equipment Companies, New Business Revenue, 2010$

Industry	Direct	Indirect	Induced	Total
Services to buildings and dwellings	$10,267,925	$42,562	$23,685	$10,334,172
Gasoline Refining		1,773,508	116,259	1,889,767
Rental Income for Property Owners			604,680	604,680
Real estate establishments		161,618	226,406	388,024
Wholesale trade businesses		87,003	259,036	346,039
Restaurants and Bars		47,701	205,208	252,909
Insurance carriers		91,266	147,377	238,643
Telecommunications		167,457	70,178	237,635
Medical and Dental Offices			221,986	221,986
Utilities		185,281	14,961	200,242
All Others		1,576,960	2,884,552	4,461,513
Total	$10,267,925	$4,133,357	$4,774,328	$19,175,610

Operational Impacts

The major losses from this regulation come as a result of the cost to farmers of conversion, their reduced budgets and yields and then the proliferate effects of these changes on the wine industry as a whole. These effects are on firms of all types, some more than others. Three key elements of these economic impacts stand out:

1. Sonoma and Mendocino counties have highly integrated tourism and hospitality markets alongside of their vineyard operations, which is different than vineyards in California's central valley on average.

2. We assume that a change in the amount of employment and yield of grapes is a function of budget shocks due to the conversion and operation of new frost protection machine installation.

3. Other industries are allied with vineyard operations such that changes to vineyards that are detrimental have a domino effect on these industries as if they are directly involved.

Table 18: Economic Impacts on Monitoring Equipment Companies, New Jobs

Industry	Direct	Indirect	Induced	Total
Services to buildings and dwellings	158.6	0.7	0.4	159.6
Food services and drinking places		0.8	3.3	4.1
Employment services		2.3	0.5	2.8
Real estate establishments		0.9	1.2	2.1
Medical and Dental Offices			1.7	1.7
Wholesale trade businesses		0.4	1.2	1.7
Private hospitals			1.3	1.3
Retail Stores - General merchandise			1.0	1.0
Retail Stores - Food and beverage			1.0	1.0
Private household operations			1.0	1.0
All Others		9.4	18.3	27.7
Total	158.6	14.5	30.9	204.0

Table 19: Economic Impacts on Monitoring Equipment Companies, New State/Local and Federal Tax Revenues, 2010$

State and Local Taxes	Amount	Federal Taxes	Amount
Employment Taxes	$30,392	Employment Taxes	$735,404
Sales taxes	255,024	Corporate Income	107,489
Property Tax: Commercial	203,171	Personal Income	624,352
Property Tax: Residential	2,776	Other Taxes and Fees	84,491
Corporate Income	38,577		
Personal Income	228,897		
Other Taxes and Fees	215,298		
Total State and Local taxes	$974,135	Total Federal	$1,551,736

Table 20: Economic Impacts on Wind Machine Equipment Companies, New State/Local and Federal Tax Revenues, 2010$

State and Local Taxes	Amount	Federal Taxes	Amount
Employment Taxes	$214,962	Employment Taxes	$5,454,550
Sales taxes	1,570,679	Corporate Income	595,762
Property Tax: Commercial	1,251,320	Personal Income	4,933,285
Property Tax: Residential	21,935	Other Taxes and Fees	520,372
Corporate Income	213,813		
Personal Income	1,808,619		
Other Taxes and Fees	1,380,307		
Total State and Local taxes	$6,461,635	Total Federal	$11,503,969

As discussed above, the Wine Institute has done studies since 2000 about the economic impact of the wine industry on the California economy. These studies have consistently estimated the number of employees throughout California whose jobs are directly tied to the wine industry. The theory is that if it were not for the wine industry's existence in California, these jobs in wine-allied industries would not exist in California. If losses in vineyards due to this regulation make for losses in wineries as well, the combination of these losses will begin a ripple effect through many industries, but will originate in these allied industries. The following are the estimated losses of employees in wineries and vineyards, as well as in allied industries.

Table 21: Business Income Losses of Vineyards due to 10% & 30% Crop Loss, 2010$

Industry	Direct	Indirect	Induced	Total at 10% Crop Loss	Total at 30% Crop Loss
Fruit farming	$58,959,666	$255,109	$20,162	$59,234,937	$177,704,811
Ag Support activities		6,665,729	9,046	6,674,775	20,024,325
Rental income			3,159,045	3,159,045	9,477,135
Petroleum refineries		2,488,835	603,547	3,092,382	9,277,146
Wholesale trade businesses		1,563,591	1,341,955	2,905,546	8,716,638
Real estate establishments		1,026,317	1,171,707	2,198,024	6,594,072
Banks		1,285,530	513,687	1,799,217	5,397,651
Bars and Restaurants		94,350	1,067,489	1,161,839	3,485,517
Medical Offices		1	1,153,146	1,153,147	3,459,441
State/Local Government		742,283	319,999	1,062,282	3,186,846
All Other Industries		8,084,574	15,484,752	23,569,454	70,708,361
Total	$58,959,666	$22,206,319	$24,844,535	$106,010,648	$318,031,943

Table 22: Lost Jobs in Vineyards from 10% & 30% Crop Loss

Industry	Direct	Indirect	Induced	Total at 10% Crop Loss	Total at 30% Crop Loss
Fruit farming	508.9	2.2	0.2	511.3	1,534
Support activities for agriculture and forestry		218.6	0.3	218.9	657
Food services and drinking places		1.5	17.2	18.7	56
Wholesale trade businesses		7.5	6.4	13.9	42
Real estate establishments		5.6	6.3	11.9	36
Medical Offices		0.0	9.1	9.1	27
Private hospitals		0.0	6.6	6.6	20
Banks		4.1	1.6	5.8	17
Retail Stores - General merchandise		0.1	5.1	5.2	16
All Other Industries		38.8	108.1	146.8	441
Total	**508.9**	**278.4**	**160.9**	**948.2**	**2,845**

Table 23: Lost State/Local and Federal Tax Revenues, 10% and 30% Crop Loss, Vineyards

State and Local Taxes	10% Loss	30% Loss	Federal Taxes	10% Loss	30% Loss
Employment Taxes	$78,518	$454,992	Employment Taxes	$1,936,860	$11,223,651
Sales taxes	772,531	4,476,635	Corporate Income	349,641	2,026,090
Property Tax: Commercial	615,232	3,565,124	Personal Income	1,686,552	9,773,172
Property Tax: Residential	7,378	42,751	Other Taxes and Fees	255,842	1,482,542
Corporate Income	125,418	726,766			
Personal Income	618,394	3,583,446			
Other Taxes and Fees	650,275	3,768,191			
Total State and Local taxes	$2,867,746	$16,617,905	**Total Federal**	$4,228,895	$24,505,455

Tables 24 through 26 provide similar information as Tables 21-23 but for wineries instead of vineyards. It is important to recognize that wineries use grapes from vineyards as a direct input, but are distinct business operations from the farming, even if the winery owns vineyards.

Table 24: Lost Jobs in Wineries from 10% and 30% Crop Loss

Industry	Direct	Indirect	Induced	Total at 10 % Crop Loss	Total at 30% Crop Loss
Wineries	1,904	94		1,998	5,994
Wholesale trade businesses		701	87	788	2,364
Fruit farming		493	2	495	1,485
Food services and drinking places		56	231	287	861
Management Consulting		246	14	260	780
Support activities for agriculture and forestry		211	4	215	645
Real estate establishments		95	86	181	543
Transport by truck		160	20	180	540
Medical Offices			123	123	369
Employment services		75	37	112	336
All Other Industries		1,194	1,558	2,752	8,257
Total	1,904	3,325	2,162	7,391	22,174

Table 25: Business Income Losses of Wineries due to 10% and 30% Crop Loss

Industry	Direct	Indirect	Induced	Total at 10% Crop Loss	Total at 30% Crop Loss
Wineries	$1,085,789,940	$53,517,950	$246,465	$1,139,554,355	$3,418,663,065
Wholesale trade businesses		146,108,775	18,240,212	164,348,987	493,046,961
Management Consulting		58,329,168	3,297,745	61,626,913	184,880,739
Fruit farming		57,099,706	273,904	57,373,610	172,120,830
Imputed rental activity			42,161,345	42,161,345	126,484,035
Real estate establishments		17,484,874	15,962,060	33,446,934	100,340,802
Glass container manufacturing		31,124,809	50,212	31,175,021	93,525,063
High-tech manufacturing		24,969,466	484,384	25,453,850	76,361,550
Transport by truck		22,001,728	2,738,248	24,739,976	74,219,928
Petroleum refineries		13,703,246	8,166,800	21,870,046	65,610,138
All Other Industries		253,733,939	242,807,502	496,543,344	1,489,630,033
Total	$1,085,789,940	$678,073,661	$334,428,877	$2,098,294,381	$6,294,883,144

Table 26: Lost State/Local & Federal Tax Revenues, 2010$, 10% and 30% Crop Loss, Wineries

State and Local Taxes	10% Loss	30% Loss	Federal Taxes	10% Loss	30% Loss
Employment Taxes	$2,229,716	$6,689,149	Employment Taxes	$52,852,463	$158,557,389
Sales taxes	51,843,283	155,529,849	Corporate Income	8,570,412	25,711,237
Property Tax: Commercial	41,302,114	123,906,342	Personal Income	43,585,145	130,755,436
Property Tax: Residential	194,220	582,659	Other Taxes and Fees	17,175,099	51,525,296
Corporate Income	3,077,047	9,231,140			
Personal Income	15,979,316	47,937,947			
Other Taxes and Fees	26,421,471	79,264,414			
Total State and Local taxes	$141,047,166	$423,141,499	**Total Federal**	$122,183,119	$366,549,358

The Wine Institute studies have consistently estimated the number of employees throughout California working in industries that are directly tied to the wine industry. Table 4 provides the latest estimates. The theory is that if it were not for the wine industry's existence in California, these jobs would not exist in California.

Table 27: Estimated Lost Jobs to Allied Industries, 10% and 30% Crop Loss Scenarios

Allied Industries	10% Totals	30% Totals
Boxes/Inserts and Bags	12.4	37.3
Cooperage	3.7	11
Corks/Caps/Screwtops	0.9	2.8
Distributor	51.9	155.6
Education and Research	0.5	1.4
Glass Bottles	12.9	38.6
Labels	8.4	25.1
Grapevine Nurseries	20.7	62.1
Retail/Liquor/Grocery	16.9	50.6
Restaurants	159.6	478.8
Stainless Steel	2.3	6.9
Trucking	7.9	23.7
Vineyard Development	221.9	665.7
Warehousing	4.5	13.4
Totals	**524.4**	**1,573.1**

Table 28: Estimated Business Revenues Lost, Allied Industries, 10% and 30% Crop Loss

Allied Industry	10% Loss	30% Loss
Boxes/Inserts and Bags	$3,297,014	$9,891,043
Cooperage	589,978	$1,769,934
Corks/Caps/Screwtops	169,236	$507,707
Distributor	9,621,185	$28,863,555
Education and Research	78,801	$236,402
Glass Bottles	3,691,881	$11,075,642
Labels	1,146,414	$3,439,242
Grapevine Nurseries	3,031,578	$9,094,733
Retail/Liquor/Grocery	1,851,538	$5,554,613
Restaurants	14,069,664	$42,208,993
Stainless Steel	852,400	$2,557,200
Trucking	1,198,233	$3,594,698
Vineyard Development	11,339,907	$34,019,721
Warehousing	$487,850	$1,463,551
Totals	**$51,425,678**	**$154,277,034**

Table 29: Estimated Federal and State/Local Tax Revenues Lost, 10% and 30% Crop Loss

	Federal Taxes		State/Local Taxes	
Allied Industry	**10% Loss**	**30% Loss**	**10% Loss**	**30% Loss**
Boxes/Inserts and Bags	$193,013	$579,039	$134,841	$404,522
Cooperage	39,221	117,662	24,256	72,769
Corks/Caps/Screwtops	12,836	38,508	6,991	20,974
Distributor	874,380	2,623,140	1,067,741	3,203,222
Education and Research	7,785	23,354	3,833	11,499
Glass Bottles	225,790	677,369	159,598	478,795
Labels	110,384	331,153	60,655	181,964
Grapevine Nurseries	254,851	764,554	143,280	429,839
Retail/Liquor/Grocery	175,792	527,375	218,739	656,217
Restaurants	1,144,438	3,433,313	1,009,393	3,028,180
Stainless Steel	40,144	120,433	29,085	87,254
Trucking	89,868	269,604	54,465	163,394
Vineyard Development	1,461,883	4,385,648	638,710	1,916,131
Warehousing	52,170	156,510	26,851	80,552
Totals	**$4,682,555**	**$14,047,665**	**$3,578,438**	**$10,735,314**

From these lost job numbers, we can estimate the economic impacts to California as a result of this regulation, where the job losses are likely sooner than later, but the lost business revenues and tax receipts for all levels of government are ongoing. Tourism is shown on its own, as it is tied very directly to the fates of both vineyards and wineries in these counties. From Table 4 above, the number of employees in winery tourism is tied to those in vineyards almost one to one; to remain conservative we will assume a one-to-two, tourism-to-vineyard worker ratio and show the resulting losses in revenue, jobs, and taxes. Assuming there is a loss of 509 vineyard jobs following a 10% reduction in crop yields due to the regulation, there would be 254.5 lost tourism jobs directly related to wine in Sonoma and Mendocino counties. The IMPLAN® model is used here specific to tourism because of tourism's many links to the economy.

Table 30: Lost Jobs from Reduction in Tourism, 10% and 30% Crop Loss Scenario

Industry	Direct	Indirect	Induced	Total at 10% Crop Loss	Total at 30% Crop Loss
Food services and drinking places	127.0	4.3	6.3	137.7	413.1
Other amusement and recreation industries	127.0	0.0	0.3	127.4	382.2
Real estate establishments	0.0	8.1	2.4	10.5	31.5
Employment services	0.0	6.6	1.0	7.6	22.8
Wholesale trade businesses	0.0	3.8	2.4	6.2	18.6
Services to buildings and dwellings	0.0	3.7	0.7	4.3	12.9
Offices of physicians, dentists, and other health practitioners	0.0	0.0	3.3	3.3	9.9
Accounting, tax preparation, bookkeeping, and payroll services	0.0	2.6	0.4	3.0	9
Performing arts companies	0.0	2.6	0.2	2.8	8.4
Management of companies and enterprises	0.0	2.4	0.4	2.8	8.4
All Others	0	37.7	41.5	79.1	237.3
Total	254.0	71.8	58.9	384.7	1,154.1

Table 31: Lost Business Incomes from Reduction in Tourism, 2010$, 10% and 30% Crop Loss

Industry	Direct	Indirect	Induced	Total at 10% Crop Loss	Total at 30% Crop Loss
Other amusement and recreation industries	$15,446,966	$4,992	$37,717	$15,489,675	$46,469,025
Food services and drinking places	7,897,789	270,445	391,917	8,560,151	25,680,453
Real estate establishments		1,497,898	435,984	1,933,882	5,801,646
Wholesale trade businesses		793,794	498,004	1,291,798	3,875,394
Imputed rental activity for owner-occupied dwellings			1,146,847	1,146,847	3,440,541
Insurance carriers		523,048	280,076	803,124	2,409,372
Petroleum refineries		464,386	222,767	687,153	2,061,459
Management of companies and enterprises		564,793	89,930	654,723	1,964,169
Electric power generation, transmission, and distribution		417,534	101,154	518,688	1,556,064
Offices of physicians, dentists, and other health practitioners		3	424,920	424,923	1,274,769
All others		7,998,385	5,483,381	13,481,766	40,445,298
Total	$23,344,755	$12,535,278	$9,112,697	$44,992,730	$134,978,190

Table 32: Lost Federal and State/Local Tax Revenue from Lost Tourism Jobs/Revenue

(10% and 30% Crop Loss)

State and Local Taxes	10% Loss	30% Loss	Federal Taxes	10% Loss	30% Loss
Employment Taxes	$61,781	$185,343	Employment Taxes	$1,454,515	$4,363,545
Sales taxes	934,893	2,804,679	Corporate Income	347,784	1,043,352
Property Tax: Commercial	744,805	2,234,415	Personal Income	1,186,559	3,559,677
Property Tax: Residential	5,276	15,828	Other Taxes and Fees	309,734	929,202
Corporate Income	124,816	374,448			
Personal Income	435,011	1,305,033			
Other Taxes and Fees	652,790	1,958,370			
Total State and Local taxes	$2,959,372	$8,878,116	Total Federal Taxes	$3,298,592	$9,895,776

Conclusions and Policy Recommendations

This study provides an estimate as to the economic effects of a State Water Resources Control Board regulation concerning the use of Russian River water for frost protection in vineyards. This use of water is claimed to be detrimental to the natural habitat of specific, protected salmonid species. The economic impact of this regulation would begin with the costs of converting current, water-based frost protection to another method (most likely wind machines), but the regulation may also require farmers to pay for river diversion (water use) and stream habitat monitoring equipment where needed. The temporary stimulus from this regulation is that it would provide temporary demand for firms that sell, install or do both for wind machines and the monitoring equipment. This acts as a mitigating factor concerning the effects on California's economy.

The larger effects of this regulation are due to the multiplier effect not being constrained to vineyards. Because wineries rely on vineyards delivering a certain amount of yield in their planning and bottling strategy, a loss of harvested grapes due to new vineyard costs that act like a tax on farmers reduces the ability of wineries to produce wine. This forces their revenues to go down. Because both vineyards and wineries are tied to many other industries in California, tourism being one of the largest but also rootstock nurseries, vineyard management and distribution, the effects of this regulation will start a domino effect with consequences well beyond the immediate effects on vineyards.

Even if we assume a modest 10% reduction in harvest grapes to Sonoma and Mendocino counties, the two counties most affected by this regulation due to geography, the effect on the California economy would be significant. Sonoma and Mendocino counties add up to about 25% of the wine industry depending on what part of the industry is of focus. The state of California will lose much more in tax revenue than it will gain through the small number of industries that would benefit from implementation of non-water-based frost protection. Further, farmers that are landowners will also experience a reduction in their land values since this regulation will directly affect the land's productivity through higher costs. In summary, the California economy is estimated, over the next five years, to experience the following economic effects from this regulation:

- Loss of business income
- Loss of jobs
- Loss of state and local taxes
- Loss of land values

The regulation could cost California over $2 billion annually, as well as almost $142 million in tax revenue (see below) to local governments and Sacramento at 10% crop losses. The mitigation of the benefit to wind and monitoring equipment companies is estimated as if all farmers will convert, pay the full price, and remain in business; if the crop or business losses are more significant, the mitigation is smaller and the costs rise further. Land values that are already in freefall from the real estate bubble bursting will fall further specific to vineyard land. Tables 33 and 34 provide summaries, assuming 10% and 30% crop losses.

Table 33: Sonoma and Mendocino Economic Impact from Regulation, 10% Crop Loss

Category	Lost Jobs	Lost Business Income (Annual)	Lost State and Local Taxes (Annual)
Due to Vineyard Losses	948	$106,010,648	$2,867,744
Due to Winery Losses	7,391	2,098,294,381	141,047,166
Due to Tourism Losses	384	44,992,730	2,959,372
Due to Allied Industries Losses	524	51,425,678	3,578,438
Mitigation* (Wind/Monitoring Equipment)	+1,110	+173,951,579	+7,435,770
Totals (lost jobs and annual $)	8,137	$2,126,771,858	$143,016,950
		Lost Value	Lost Property Taxes
Lost Land Value		$113,697,867	$1,250,677

***Assumes no farmers go out of business before they convert frost protection to wind**

Table 34: Sonoma and Mendocino Economic Impact from Regulation, 30% Crop Loss

Category	Lost Jobs	Lost Business Income (Annual)	Lost State and Local Taxes (Annual)
Due to Vineyard Losses	2,845	$318,031,943	$16,617,905
Due to Winery Losses	22,174	6,294,883,144	423,141,499
Due to Tourism Losses	1,154	$134,978,190	$8,878,116
Due to Allied Industries Losses	1,573	154,277,034	10,735,314
Mitigation* (Wind/Monitoring Equipment)	+1,110	+173,951,579	+7,435,770
Totals (lost jobs and annual $)	26,637	$6,728,218,732	$451,937,064
		Lost Value	Lost Property Taxes
Lost Land Value		$341,094,000	$3,752,000

***Assumes no farmers go out of business before they convert frost protection to wind**

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Exhibit T

EFA

Economic Forensics & Analytics

Review of Economic Impact of the Proposed Russian River Frost Regulation

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EXHIBIT T

May 10, 2011

Review of Economic Impact of the Proposed Russian River Frost Regulation

SWRCB Document Dated 3/21/2011

Executive Summary

This document provides a summary and critique of a recent draft document from the California State Water Resources Control Board (SWRCB) concerning the economic impact of a proposed regulation to limit or eliminate the use of water from the Russian River watershed to protect winegrape vineyards and pear orchards for frost protection purposes in Mendocino and Sonoma counties. The SWRCB document focuses on winegrape vineyards more than pears, where pear farms only pertain to Mendocino County. The SWRCB document provides an estimate of the acreage to be affected by major varietal, the potential regulatory cost to farmers, and the economic impacts on the winegrape industry and its multiplier effects based on the estimated regulatory costs. The SWRCB document concludes by providing an overview of economic impacts; the stated benefits of which would mainly be to the habitat of salmonid fisheries and fishing throughout the Russian River basin. The benefits are anecdotally stated and not estimated in terms of economic impact. The SWRCB document also suggests that over 3,000 businesses in the two counties would be directly or indirectly affected in terms of cost.

The number of acres to be affected is estimated as a small portion of the two counties' totals. This is problematic because if the affected acres rise from those estimated, the economic impacts rise. Also, the analysis simply spreads the costs of installing new capital equipment evenly over a 30-year period. Such an even spread does not recognize up-front costs for farmers that may be needed to initiate a loan or the project itself. By not considering cash flow will be larger in the first five years to install the corrective equipment or conform initially to the proposed regulation over the timeline of the analysis (five years from regulation inception), the costs to winegrape farmers are grossly understated. Finally, the association of winegrape farms to other, affected businesses (the multiplier effects), is much smaller in the SWRCB Document than if the SWRCB Document followed the standard method used in the wine industry to see how other firms are impacted. In short, the SWRCB document results understate the proposed regulation's cost by underestimating the number of acres to be regulated, using a simplified economic impact analysis and by not integrating the true capital cost cash flows into the annual regulatory cost figures.

A review of the SWRCB document reveals that there are some large assumptions made by the author about the economic impacts of this regulation on the winegrape industry, and the economic impact analysis understates the impacts due to the method used in calculating the impacts. In short, the major issues are as follows:

- The capital costs of converting or "correcting" non-compliant vineyard are likely understated for the five-year period of analysis and thus contribute to an understatement of the economic impacts;
- The economic impact analysis uses multipliers only for winegrape vineyards and assumes intra-industry effects that are smaller than the most recent impact multiplier in Sonoma and Mendocino counties for winegrape or pear farms; and
- The study likely underestimates the number of farms to come under the regulation by providing no pinpoint geography of the proposed regulation and assuming the typical winegrape farm is 160 acres in size.

Introduction

This study (the Review) provides a review of a draft document ("SWRCB Document") produced by the State Water Resources Control Board (SWRCB) of California on March 21, 2011. The document is titled, "Economic Impact of the Proposed Russian River Frost Regulation". The Review will recalculate the economic impact of the proposed regulation based on some of the caveats listed below in the SWRCB Document's methods. The SWRCB Document has six sections; the first two are simply descriptions of the regulation and the SWRCB Document's purpose. The Review follows the last four sections of the SWRCB Document:

A. Description of the Russian River Watershed wine and pear growing industry in Mendocino and Sonoma counties (as these are the local agricultural industries that use frost protection);
B. Description of a water demand management program and localized economic impacts;
C. A regional economic impact analysis; and
D. An appendix provides the calculations used as inputs in the economic impact analysis.

A. Description of the Russian River Watershed

The SWRCB Document attempts to determine the number of acres that will be impacted by the regulation through a variety of assumptions and estimations. The SWRCB Document tables 3-1 through 3-5 set up the basic analysis of regulatory costs to farmers and ultimately to the county economies. These tables define the estimated area that may be affected, which helps to estimate the number of affected businesses. Based upon SWRCB Document's Table 3-5, approximately 74,320 acres in Mendocino and Sonoma counties could be affected by the regulation.

The SWRCB Document then goes on to reduce the amount of affected acreage to a total of 21,198 acres (Table 3-8). If the number of acres under protection increases from these estimates, so do the potential number of stations needed to monitor and assess compliance, the number of vineyards, and ultimately the economic impacts. An important aspect of the SWRCB Document is that it assumes less than the total acreage in these counties will be affected by the regulation.

It is likely, however, that <u>all</u> winegrape and pear acreage in Sonoma and Mendocino counties would be "assessed" for exposure to a regulatory violation. Thus, it is possible that all acres in these counties will be asked to engage in some "corrective" action. For example, in Mendocino County, the report suggests there would be no wind machines installed or used (Table 4-11 shows no acreage in Mendocino protected by wind). Any frost protection, compliant or non-compliant, would involve water use. That exposes the entirety of Mendocino's winegrape and pear farms to this proposed regulation if the initial assessment suggests corrections need to be made to all winegrape and pear farms, which is a risk to farmers as a result of the regulation.

The SWRCB Document also assumes that the temperature in Sonoma County is uniform, and based upon this uniformity, estimates the amount of water used for frost protection. Table 4-7 provides this data, which is connected to the fourth column of Table 4-6 labeled "Frost Protection Availability Factor". These data estimate the acre-feet of water used per acre per year for frost protection from available sources. The percentage assigned to Sonoma County is the same as Hopland, the southernmost town in Mendocino County with a weather station (see footnote 1 of Table 4-7). Yet this assumption is incorrect. Looking at the weather data in Hopland since 1989, between the dates of March 15 and May 15, the average daily low was under 40 degrees only 4 days which is "warmer" than weather stations in Sonoma County; it seems likely that a statistical analysis of the daily temperatures in Hopland would show it to be warmer than other points to the south with statistical significance, Hopland would use less water than its southern neighbors. By using Hopland as the basis for water use, the SWRCB Document is underestimating the amount of water needed in Sonoma County, and therefore the costs of the regulation. In summary, the SWRCB Document's description of the Russian River watershed underestimates the cost of the program by underestimating the amount of water needed for frost protection in Sonoma County and the number of acres potentially affected by the regulation.

B. Description of a Water Demand Management Program and Localized Economic Impacts

This section of the SWRCB Document describes the elements of a water demand management program, and then discusses the possible economic impacts of that program on the local economies. However, due to its interrelationship with the following section, discussed below, this Review will discuss both local and regional economic impacts below.

C. Local and Regional Economic Impacts

The SWRCB Document's economic impact analysis blends portions of its sections 4 and 5 and also uses its Appendix (section 6). The economic impact analysis of the SWRCB Document boils down to three key issues:

1. Capital costs used in final analysis and number of businesses affected underestimated;
2. Use of IMPLAN Multipliers not the same as use of IMPLAN itself; and
3. Typical farms are stated to be 160 acres in size, which implies a small number of farming businesses based on the stated acreage by NASS.

1. Capital Cost of Water Demand Management Program under Proposed Regulation

The capital cost analysis is a critical factor in determining the economic impact of this regulation on winegrape farmers. Having the capital costs included means there should also be an analysis of the benefits to local contractors and firms that specialize in building ponds, dams, wind machines, etc. Overall, there could be a net benefit calculation.

On the other hand, the capital costs depend on the farmer's ability to finance the mandated cost in the first place. If farmers foresee a relatively large cost per acre to comply with the proposed regulation, and decide to cease operations, or reduce their acreage in wine grapes or pears to reduce the costs, then no benefits will be realized by firms providing support to a new water demand management program.

In addition, there is an assumption of a 50% payment cost reduction, paid for by a USDA program. This assumes all affected parties will be eligible for the USDA funding, that the funds are able to satiate the demand from this proposed regulation, and the program funding will remain intact, which may or may not be likely. If the "state" regulation goes into place, and the costs to farmers are two years off, the federal funding to support this may be exhausted. The impacts on farmers increase significantly if this is the case. The capital costs need to be amortized over the 5-year analysis (see below) in the least, and a net benefit analysis would also help make the calculations more realistic to the cash outflow for farmers to be compliant.

Since wind is not an effective form of frost control in Mendocino County, by Table 4-11's statement, then the costs for Mendocino farmers are differentially higher to comply than in Sonoma County. The numbers further estimate that there will be 70% of affected Mendocino acreage and 65% of Sonoma acreage to install ponds, which is the most costly of the alternatives.

Finally, the report seems to use bearing acreage only. If the monitoring is not to start for another two years, currently non-bearing acreage will then be bearing in some proportion. As a cover, all acreage should be used; also, the regulation will likely reduce the planting of new acreage, which directly affects firms that specialize in vineyard management and planting. The economic impact analysis in the SWRCB Document has other shortcomings, including the assumption that many industries are indirectly affected versus being directly affected by changes to vineyard production and cost (e.g., vineyard management and wineries that buy and transfer grapes from vineyards at a certain cost that may rise to cover the regulation's cost).

Further, the capital costs are assumed to spread evenly over a 30-year period. This assumes that the farmer will not have to pay a down payment to receive a loan from a financial institution at an estimated six percent rate of interest. If a down payment is necessary, or if the interest rate increases from 6%, the cost to the farmer rises. If these costs rise, the negative economic impacts as stated in the SWRCB document are underestimated.

2. *Use of IMPLAN Multipliers Not the Same as Using IMPLAN Itself*

Rather than rely on the IMPLAN model, the SWRCB Document simply uses the multipliers of an older IMPLAN version as a statement of intra-industry effects. As a result, the SWRCB Document underestimates the regional income and employment impacts of the regulation. Table 5-2 in the SWRCB Document provides estimated employment impacts from the estimated loss of vineyard revenue using a simple multiplier of 1.95 jobs per grape growing job lost for every $1 million in lost production value. Based on Table 5-2, the SWRCB Document estimates that limited job loss will result from the regulation; Table 1 replicates these data.

Table 1: Replication of Table 5-2 in SWRCB Document

	Year 1	Year 2	Year 3	Year 4	Year 5
Lost Employment	**4**	**7**	**11**	**14**	**18**

Unfortunately, the SWRCB Document uses the RIMS II multipliers and states these multipliers to be from 2007 and for California overall using the NAICS code[1] for "Fruit Farming". The footnote to SWRCB Document's Table 4-16 suggests this is 1.643502 for lost production value; for every $1 lost in

[1] The relevant NAICS codes are 111332 for grape vineyards and 111320 for pear farming. Within IMPLAN, there is a way to match NAICS codes to IMPLAN sectors, as many NAICS code industries are similar in their economic effects.

grape or pear farming, $1.643 are lost to the CA economy overall[2]. Using the most recent IMPLAN model, which uses RIMS III multipliers, and can be applied specifically to Sonoma and Mendocino counties, we see very different employment loss numbers:

Table 2: Replication of Table 5-2 in SWRCB Document Using Most Recent 2009 Sonoma County Multipliers, IMPLAN

	Year 1	Year 2	Year 3	Year 4	Year 5
Lost Employment	**6.3**	**12.7**	**19.2**	**25.6**	**32**

In addition, Table 3 below shows the results of losing $1,000,000 of production (as measured by reduced revenue) for grape farming.

Table 3: IMPLAN Results for $1,000,000 of Lost Farm Revenue on the County Economy

Lost Employment	Lost Labor Income	Lost Value Added	Lost Business Revenue
15.7	$634,649	$933,904	$1,798,751

Source: EFA and IMPLAN®

Looking at incomes and jobs, losing $1,000,000 from grape farming reduced jobs by 15.7 throughout the local economy, has a 1.798 multiplier effect on other business incomes per $1 lost of farmer revenue in these counties, and over $634K in wages if $1 million in revenue was lost. Providing a similar table to the list shown in section 5.1 of the SWRCB Document, we see that the types of firms most affected, and the percentage of intra-industry effects, are somewhat different with the latest and geography-specific multipliers in Table 3. Further, the breadth of industries affected shown in the SWRCB Document is not in agreement with the latest multipliers. Table 4 recasts Table 5-2 in the SWRCB Document using multipliers used to generate the data in the Review's Tables 2 and 3 above[3].

Table 4: Replication of Table in Section 5.1 of SWRCB Document Using Updated Figures

Industry	Implied Percent of Effects
Fruit farming	55.9%
Agriculture support activities	6.4%
Rental Income for Land Owners	3.0%
Gas refineries	2.9%
Wholesale trade businesses	2.7%
Real estate establishments	2.1%
Banks and Credit Unions	1.7%

[2] As can be seen in Table 3, for every $1 lost using the Sonoma County multipliers from 2008 and the IMPLAN model overall, the business revenue multiplier is $1.799, which is greater than the $1.643 stated in the SWRCB Document.

[3] Note that these estimates assume the capital costs are not amortized and follow the SWRCB Document.

Bars and Restaurants	1.1%
Doctor and Dentist offices	1.1%
State and local government enterprises	1.0%
Electric power generation, transmission, and distribution	1.0%
Private hospitals	0.9%
Insurance carriers	0.8%
Pesticide and other agricultural chemical manufacturing	0.7%
Investment banking	0.6%
Legal services	0.6%
Transport by truck	0.5%
Pharmaceutical preparation manufacturing	0.5%
Telecommunications	0.4%
Wood container and pallet manufacturing	0.4%
Grocery Stores	0.4%
Natural gas distribution	0.4%
Maintenance and repair construction of commercial real estate	0.4%
Others	14.5%
Total	**100.0%**

3. Typical farms are stated to be 160 acres in size, which implies a small number of farming businesses based on the stated acreage by NASS

On page 30 of the SWRCB document, Table 4-17 states that the reporting cost for a typical business will be $151, assuming a typical business is composed of 160 acres. No explanation is given why 160 acres was chosen as the "typical" size. The appropriate method of determining the number of business affected would be to use the number of bearing acres in Sonoma and Mendocino counties from the Grape Acreage report and recent figures from the Employment Development Department of California (EDD) on the number of grape vineyards that are in Sonoma and Mendocino counties as payroll establishments. However, even then the numbers of acres per farm will be artificially high because some farmers do not pay any wages because they own a self-proprietorship without any ancillary labor, do not pay W-2 workers, or pay contract labor, all of which will not show up in the EDD figures concerning number of businesses. In addition, some vineyard operations are counted within the number of wineries, a different industrial category in the North American Industry Classification System (NAICS) codes. As a result, the actual number of firms that are growing grapes is likely larger for that reason as well, which means more business are affected than the SWRCB Document estimates.

It is important that accurate figures are used in this analysis. If the number of farms increases from the current estimates, the number of grape-growing operations affected by the proposed regulation rises. This would, in turn, increase the negative economic impacts to the wine industry and the county economies as calculated because more acreage would also fall under the proposed regulation.

In summary, the SWRCB Document's economic impact analysis is understated for three major reasons:

1. The way capital costs per acre are used within the calculation of the economic detriment of the regulation on the California economy underestimates the negative impacts;

2. The multipliers used for estimating the effects are smaller than the most recent and geographically-specific multipliers for Sonoma and Mendocino counties; and

3. The number of firms and acres affected is likely underestimated as well as the breadth of firms that are directly affected by the proposed regulation.

In combination, these summary points suggest that the overall, negative economic impacts of the regulation of the counties of Sonoma and Mendocino, and ultimately on the state of California, are underestimated.

C. Appendix Calculations

The Appendix shows Tables 6-1 through 6-16 and provides the estimation data used in the economic impact analysis. The link between the Appendix and the economic impact is as follows. The percentage decrease in the value of production per acre is calculated by using the annual cost of compliance from Table 4-14 divided by the value of production per acre. This is the percentage change in "cost", which then implies a subsequent change in acres of production based on the elasticities. The reduction of acres is then multiplied by the value of production per acre to determine the lost production value in dollars, and then multiplied by the number of affected acres for the initial economic impact. That lost value is then multiplied by 1.634 per the assumed "output" multiplier to determine the dollars lost, which then is divided by $1,000,000 and multiplied by the multiplier for jobs of 1.94 to find the lost jobs. **The capital costs are in these numbers, but assumed to be amortized evenly over 30 years as if an even cash outflow will take place once any action is mandated.** The flow of these Appendix tables is as follows:

- Using the figures from Table 4-14, which are the calculated and summarized costs per acre for parcels with no corrective action to be taken and those with corrective action to be taken, the first table provides the objective data from the government sources and then uses Table 4-14 figures to calculate a percentage change in value per acre.
- The second table of each section combines the data from the first table and the data from the UC Davis study on supply price elasticities. The first table's last column is multiplied by the second and third columns of the second table to generate the second table's columns 4 and 5. Those two columns are multiplied, respectively, by the first column of the second table to generate the estimated reduction in acres.
    - *An interesting side note is that Chardonnay in all cases sees an increase in acreage as a result of higher costs of production in the long run.*
- The third table of each section uses the yield calculation from the first table and multiplies that by the final two columns of the second table. This provides an estimate of lost tonnage, which then is multiplied by the value per ton in the first table to get the reduction in farmer revenue in the short and the long run. The final two columns of the third table provide the bookend values for each row of the fourth table.
- The fourth table simply distributes values for each of five years using the bookends above. By taking the absolute value of the difference between the short-run and long-run values from the

third table's final columns above, divide that difference by 4 and add that value to the short run until you get to the long run value in year 5.

There seems to be no issue with the methods in the Appendix as much as the data used to determine the final values and the methods used once these figures are in place for the economic impact analysis. Again, it is convenient that Chardonnay has a negative, long-run supply elasticity, which reduces the overall impacts. It also assumes that the long run is five years; given that new grapes take 3-5 years to bear fruit, I am not sure why five years would be considered the long run versus 20 to 30 years, which would also increase the negative economic impact to farmers.

D. SWRCB Document Summary

To summarize, the SWRCB Document is similar to the original document shown in 2010 by SWRCB. The costs of monitoring, reporting, assessment, and new capital formation is squarely on farmers, short of the 50% shared cost for a new reservoir, assumed to be covered by a federal government subsidy, which may or may not remain in place. The SWRCB Document assumes that a small number of acres would be frost protected in Mendocino County It is critical to consider the loss of farmers due to the imposed cost. The non-corrective and corrective action acres make the estimates smaller than they originally were in the 2010 version. Water use is assumed to be the same throughout Sonoma County, which cannot be true. If wind is the least costly, but does not work in all areas, we must assume that the proposed regulation will cost farmers more. If corrective actions are seen as coming in year 2 after initial assessment, those corrective costs of building capital are not in the overall impacts as cash flows for farmers. The SWRCB Document assumes wind will not apply anywhere in Mendocino County, and that most farmers will have to install ponds, if that is even possible. The big issues with the SWRCB Document's economic Impact analysis and conclusions are:

- The capital costs of converting or "correcting" non-compliant vineyard are likely understated for the five-year period of analysis and thus contribute to an understatement of the economic impacts;
- The economic impact analysis uses multipliers only for winegrape vineyards and assumes intra-industry effects that are smaller than the most recent impact multiplier in Sonoma and Mendocino counties for winegrape or pear farms; and
- The study likely underestimates the number of farms to come under the regulation by providing no pinpoint geography of the proposed regulation and assuming the typical winegrape farm is 160 acres in size.

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Exhibit U

PROPOSAL

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February 16, 2010

Bowland Vineyard Management
4005 Barnes Road
Santa Rosa, Ca. 95403

RE: Drake Rd Vineyard

Chris:

The following is our estimate to install a flow meter to read gallons per minute as well as time of day on each of the wells at Drake Rd as per the outline below.

(a) We will supply and install a Sonic–Pro ultrasonic flow meter on the discharge pipe of the pump.
(b) We will supply and install a 24v DC power supply with solar charger on the platform to power the flow meter.

Qty		Description		Unit Price		Total
1	Ea	Sonic-Pro S3c Ultrasonic flow meter	$	5,500.00	$	5,500
1	Ea	24v DC Power supply with solar charger	$	900.00	$	900
1	Ea	Miscellaneous plumbing & electrical approximately	$	600.00	$	600
		Sub total			$	7,000
2.75%		Sales tax on materials AG rate if applicable			$	193
16	Hrs	Approximate labor for one man	$	104.00	$	1,664
		Total Installed Estimate for above mentioned equipment per each well			**$**	**8,857**

Excluding:
(a) Any labor or materials other than as outlintged above.

NOTE:
A. The above is an estimate only, total price will be adjusted plus or minus according to the above unit price upon completion.
B. The above estimate is for one meter at one well.

Sincerely

Rich Richardson
Les Petersen Drilling & Pump Inc.
Estimate valid for 30 days

Approved by ________________ Date_______

EXHIBIT U

TERMS AND CONDITIONS

1. Les Petersen Drilling and Pump Inc. is not bound by any statements, warranties, or promises, expressed or implied, by Les Petersen Drilling and Pump Inc., its agents, or employees, which are not stated herein attached hereto.
2. Any invoices rendered under this contract shall carry no title or evidence thereof.
3. Title to and right of possession of all merchandise sold under this contract remains vested in Les Petersen Drilling and Pump Inc. until the full purchase price shall have been received by Les Petersen Drilling and Pump Inc.
4. Loss or damage to said merchandise by fire, theft, misuse or otherwise while in possession of Purchaser shall not relieve Purchaser from making all payments provided for herein.
5. The filling of this order is subject to fires, strikes, non-arrival of material or other causes beyond the Les Petersen Drilling and Pump Inc. control. The Purchaser hereby waives all claims for damages for loss occasioned by reason of any delay.
6. In case it becomes necessary for the Contractor to take legal proceedings to enforce any of the terms of this contract, Owner agrees to pay the legal costs, including reasonable attorney's fees incurred by Contractor for that purpose. Owner agrees to pay interest at 18% per annum on all overdue payments. All agreements subject to delay caused by strikes, fires, or other causes beyond the control of Contractor.

WARRANTY

1. The equipment sold under this contract is warranted only to the extent of the original manufacturer's warranty. No other warranties expressed, implied or statutory, other than those printed herein shall be applicable to this equipment.
2. This warranty does not apply to any damage caused by attempted or unauthorized repairs by any person or persons not authorized by Les Petersen Drilling and Pump Inc.

NOTICE

"Under the Mechanics' Lien Law (California Code of Civil Procedure, Section 1181, et seq.), any contractor, subcontractor, laborer, supplier or other person who helps to improve your property but is not paid for his work or supplies, has a right to enforce a claim against your property. This means that, after a court hearing, your property could be sold by a court officer and the proceeds of the sale used to satisfy the indebtedness. This can happen even if you have paid your own contractor in full, if the subcontractor, laborer, or supplier remains unpaid."

Exhibit V

25 March 2010

Jesse W. Barton
Gallery & Barton, APLC
1112 I Street, Suite 240
Sacramento, California 95814

Subject: ***Unit Cost Stream Gaging Proposal for tributaries to the Russian River***

In conjunction with Western Hydrologics Systems, we are pleased to submit this unit cost estimate for permitting, stream gage installation, maintenance, monitoring, data reporting, real-time data upload and web access for stream gages on the tributaries of the Russian River.

Depending upon site conditions and possible impacts to habitat, there may be a requirement for the applicant to obtain permits from the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, California Regional Water Quality Control Board and California Department of Fish and Game. ECORP routinely informally meets with U.S. Army Corps of Engineers staff to conceptually discuss upcoming projects. Regarding the installation of stream gages, we would propose to meet with agency staff and discuss the project. The intent would be to minimize jurisdictional wetland impacts thus avoiding the need to obtain permits. U.S. Army Corps of Engineers' staff have been helpful on past projects in recommending changes in design or installation procedures to avoid adverse impacts. If impacts are unavoidable then Tasks one through eight may be required prior to installing the gaging equipment. Tasks nine through eleven outline the gage installation, monitoring and associated services.

This unit cost estimate assumes that you or the property owner will obtain or grant any access permission, easements or rights of way necessary to access, install and maintain the gages. Attached, please find our detailed sample scope of work.

Thank you for your interest.

Sincerely,

Jeffrey K Meyer

Jeffrey K. Meyer
Director, Water Resources Management

Attachment(s)

EXHIBIT V

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

25 March 2010

Exhibit A

Sample Scope of Work and Cost Estimate[1] for
Environmental Services
Regarding
The tributaries to the Russian River Stream Gaging Project

Note: If permits are needed, it has been our experience that several gages or even an entire project may be covered by one authorization. For a project of this magnitude, total permitting costs could be in the range of $200,000 or more. Unit costs would be approximately $3,000 per gage. However, permitting costs for a single gage can be on the order of $25,000 - $35,000 and can take up to a year to obtain. Tasks one through eight below provides a description and cost estimate of the tasks that may be necessary to permit the gages. Tasks nine through eleven are applicable to gage equipment, installation and associated services.

Task One: ***Clean Water Act – Section 404 – NWP 5 Authorization (Pre-Construction Notification Preparation)***

- Prepare Pre-Construction Notification (PCN).
- Submit draft to client for review.
- Incorporate client comments, as appropriate, and generate submittal copy.

Task One: $5,000

Task Two: ***Endangered Species Act, Section 7 Consultation (if required)***

- Incorporate California Department of Fish and Game – Natural Diversity Database information and/or existing site assessment data to prepare *Information to Support Section 7 Consultation* attachment to application submittal.
- Request that appropriate federal agency initiate consultation with U.S. Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service (NMFS) regarding potential project related effects to federally listed or proposed species. Liaison with USFWS/NMFS to provide technical support for the development of Biological Opinion.
- Does not include the preparation of a Biological Assessment(s) if required.

Task Two: $3,500

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[1]*Estimate based on time and materials and is valid for 90 days.*
Russian River (new)

Task Three: ***Regional Water Quality Control Board, Clean Water Act, Section 401***

- Prepare and submit request package for Section 401 Water Quality Certification to Regional Water Quality Control Board. (Regional Water Quality Control Board fee to be provided by client prior to submittal).

Task Three: $4,000

Task Four: ***California Department of Fish and Game (CDFG) 1602 Application***

CDF&G often waives the need for the 1602 for gage installations and usually provides an authorization letter by email. If they waive the need for the permit, there will be no charges associated with the 1602 application. However, if they require a 1602, the following will apply.

- Prepare Streambed Alteration Notification (application) (Does not include engineering plans or CEQA documentation. Client to pay applicable fee).

- Submit draft to client for review, incorporate client comments, as appropriate, and generate submittal copy.

- Provide liaison with CDFG in processing of 1602 Streambed Alteration Agreement, to include one meeting with CDFG in the field to review project site and project design.

- Review draft 1602 Streambed Alteration Agreement and provide comments to CDFG.

Task Four: $4,500

Task Five: ***Cultural Resources Inventory***

- The cultural resources inventory of one stream gage installation location (not to exceed one acre) will be conducted by or under the direct supervision of a Registered Professional Archaeologist who meets the Secretary of the Interior's Professional Qualifications Standards for prehistoric and historical archaeologist. This study will be conducted pursuant to the requirements of the California Environmental Quality Act (CEQA) and Section 106 of the National Historic Preservation Act for the identification of cultural resources. The scope of work includes a records search (0.5-mile radius), Native American consultation (initial contacts only), a field survey and inventory when weather and ground conditions permit (no evaluation of eligibility or excavation), recording of no sites, and a confidential technical report (not for public distribution). If sites are observed, then ECORP will prepare a separate cost estimate to record and map. In compliance with the terms of agreement between ECORP and the California Office of Historic Preservation, one unbound copy of the final report will be submitted to the appropriate confidential OHP Information Center, where it will be archived and remain confidential (accessible only by qualified archaeologists).

Task Five: $5,000

Task Six: ***Regulatory Agency Liaison***

- Meet/consult with agency personnel, as required to resolve regulatory issues pertinent to the project. This task will be billed on a time and materials basis.

Task Six: $4,000

Task Seven: ***Client Liaison***

- Meet/consult with client, as required to update, consult or resolve issues pertinent to the project. This task will be billed on a time and materials basis.

Task Seven: $5,000

Task Eight: ***Mapping and Development of Sites Descriptions***

- To map the watershed and provide site descriptions compliant with USGS standards, we propose to obtain the appropriate topographic dataset for the project area, create a Digital Elevation Model, determine the natural upstream watershed areas and elevation at gage locations, and create a map series depicting natural watershed boundaries and relevant topographic data.

Task Eight: $4,000

Task Nine: ***Gage Installation***

- After any permitting requirements and access issues are resolved, stream gages can be installed. Our typical installations include a Waterlog 350/355 high Level Data Logger (Smart Gas) system, a gage house, staff gages, orifice lines, conduit and associated fittings. The system will be powered by a 115 watt solar panel & deep cycle 12 volt battery. Typical installations will look very much like the photo shown below. Other gaging equipment can also be used, but for the purpose of this estimate, equipment and installation prices are based on our typical applications.

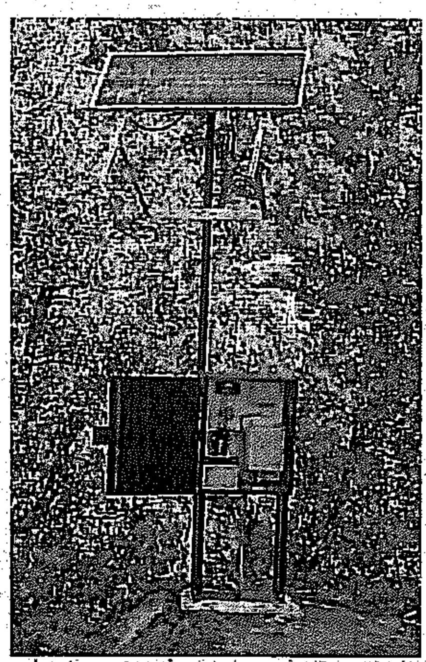

Figure 1. Typical Stream Gage Installation

Task Nine: $14,000 - $16,000 per gage

Task Ten: ***Maintenance, Monitoring and Reporting***

- Following the installation of the gaging equipment, maintenance, monitoring and reporting will be done for the period of one year. During this time field measurements will be made to begin development of the elevation-discharge rating curve for each measurement location. Ideally, the rating curve will be developed for a full range of flows within the contract period. In drier years, it is sometimes difficult to obtain high flow measurements, delaying the development of a complete rating curve. Each gage will be visited at least once a month to download the water surface elevation data and to measure flows. More frequent measurements during high runoff events may be necessary to capture the full range of flows. Review of the water surface elevation data and computed flow data will be completed prior to reporting and dissemination.

Task Ten: $8,000-$12,000 per year

Task Eleven: ***Real-time data satellite uplink and web access***

- Real-time data satellite uplink can be added to the gages. Data is available via web access and password protected. Through the webpage, the user can set stage, voltage or flow alert levels so that if any of the parameters fall below or rise above the user defined levels, a warning can be sent either by email, text or phone message. The website can also generate tables or graphs of the recent historic data by station.

- To upload the data on a real-time basis, satellite radio equipment needs to be installed at each gage site. There is a one time fee of approximately $1,000 per site for the equipment and approximately $720 per site per year for data upload. The data upload costs are based on the assumption that data transmissions will be done using 15 minute data. There will be a 5% equipment discount for ordering more than 10 units.

Task Eleven(Total Data Transfer Costs)$1,000 per gage-$720 per gage per year

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Expense Reimbursement/Other:

1. Computer, photocopying, facsimile, and telephone are included in the billing rates, and there is no additional charge.
2. Color copies, equipment and other direct expenses are reimbursed with a 14% administrative handling charge (excluding mileage and per diem).
3. Subcontractor expenses are reimbursed with a 5% administrative handling charge.
4. Mileage will be reimbursed at a per miles rate established by the IRS
5. Per Diem, depending upon geography, may be charged where overnight stays are required.
6. Expert Witness Testimony, including Depositions, are billed at time and a half.
7. A contract amendment will be negotiated to cover any out of scope items of work that the client may request.

Exhibit W

Frost Protection Technical Studies

AES Scope of Work and Cost Estimate

June 24, 2011

Understanding of the Project

It is our understanding that certain technical studies would be required under Sections 2(B) and 3 of the Proposed Frost Protection Regulation for the Russian River Watershed. The following tasks outline AES's proposed work effort and associated costs to meet these proposed requirements.

Task 1 – Background Research, Agency Consultation and Field Preparation

Numerous research documents have been produced by Sonoma County Water Agency (SCWA), among others, which identify and evaluate reach-specific utilization of the Russian River for the spawning and rearing of steelhead and salmon. In addition to those documents, a comprehensive literature review will be conducted to evaluate life stage habitat utilization of streams by salmonids. This background information will set the basis of the study to assure that the target species and life stages by season are targeted in the study design. Based on the annual index of frost events in the Russian River valley, it is anticipated that spawning and fry emergence would have already occurred in the mainstem and tributaries of the Russian River for steelhead, Chinook salmon, and Coho salmon. Therefore, it is anticipated that the targeted life stage and habitat components to be evaluated in the study will focus on potential juvenile rearing and out migrant holding habitats for the three salmonid species that occur in the Russian River and its tributaries; Coho salmon, Chinook salmon and steelhead trout. This Task would include the desktop background research and literature review, consultation with the California Department of Fish and Game (DFG) and National Marine Fisheries Service (NMFS), field preparation and review of any available site specific data required to properly implement the study design.

Task 2 – Stream Segment Habitat Typing

AES will conduct a reconnaissance field visit to the NMFS-selected stream segment to map instream flow habitats using a Geographic Information System (GIS) unit, determine where the greatest potential for drawdown effects would occur, and identify where fish stranding and/or outmigration may potentially become an issue. The site reconnaissance field visit will include mapping up to one quarter mile of stream flow habitats at the NMFS-selected stream segment and flagging of the most sensitive areas with regards to potential for juvenile salmonid stranding based on stream morphology, cross section slope, and particle size distributions in the stream margins.

Task 3 –Establishment of Cross Sections

The "critical stranding" areas identified under **Task 2** will be revisited and preliminary cross sectional measurements will be taken at the identified "critical standing" site(s) to determine which site is best suited for evaluating critical site specific stage. Once the critical cross section is identified, five evenly

EXHIBIT W

spaced transects will be established within the stream at this site to assure that field measurements are consistently recorded and the results are repeatable. Rebar will be used to mark the transects to assure that these dedicated locations are consistently measured throughout the data collection period. The most likely stranding areas include low gradient stream margin zones supporting large gravels, cobbles, and small boulder substrates in shallow edge water transitions of riffles, glides and pool tail outs as well as secondary bar channels. This field visit will aim to identify the most suitable study sites and to establish five study cross sections for data collection at the most critical site identified. These study sites may require verification by DFG and/or NMFS prior to actual data collection.

Task 4 – Stage Discharge Data Collection

After DFG and NMFS approve the study site and transect locations, primary data collection will be initiated. Data collection will include the measurement of stage and velocity for each of the five transects identified within the "critical stranding" zone. Field data collection will also include documentation of the ambient biological and physical components of each study plot (instream habitat components such as: substrate particle sizes, embeddedness, temperature, flow habitat regime, instream cover and fish presence etc.) and full photo documentation for each transect. This study design would include duplicate measures (2) of each study transect (totaling ten cross section measures per sampling event) to ensure the accuracy and precision of sampling effort and calibration of the equipment. A total of five visits will be made to each study site over the duration of the "frost season" at a minimum three distinct flow regimes which will be determined using historic USGS gauge data for the Russian River. This methodology will generate 25 distinct data points to run statistical analyses and make comparisons between distinct differences in discharge.

Task 5 – Data Entry

All data will be entered into standardized excel spreadsheets for analysis.

Task 6 – Data Analysis

The data collected from the surveys will be statistically analyzed to determine the minimum stream stage and associated discharge, as recorded at the dedicated stream gauge, to maintain juvenile rearing and holding habitats within the "critical stranding" zone to prevent stranding mortality. Standard regression analyses will be utilized to determine the stream stage that should be maintained at the site.

Task 7 – Report Preparation

The results from data analysis will be incorporated into a technical report and will include field observations to evaluate the stage relationships between transects across the "critical stranding" zone and correlate the stage the associated stream discharge to the gauged stream data. This write-up will incorporate relevant environmental documents specific to the salmonids in the Russian River watershed to evaluate the physical habitat requirements for rearing fishes and translate these requirements into a recommended stream flow to prevent stranding mortality. The report will determine the required stream stage at the site specific gauge to prevent stranding mortality.

Task 8 – Site Specific Risk Assessment/Agency Consultation

In consultation with DFG and NMFS, AES will conduct a site specific Risk Assessment based on the results of the analysis. This analysis will take into account the cumulative diversions in the vicinity, the reported consumptive use for frost events of permitted diverters and stranding potential of Salmonids based on the stream morphology and physical habitat of the stream channel at each distinct location. The Risk Assessment may include a scoring matrix to qualify the site specific data collected and weight the likelihood of a stranding event based on stream morphology, instream physical habitat, hydrologic condition, and water demand during frost protection. It is assumed that this will be an adaptive management program and collaborative effort between the Division of Water Rights, growers, DFG, NMFS and the consultant.

Schedule and Cost Estimate per Site

Task	Timeline (Cumulative Duration)	Estimated Cost
Task 1 - Background Research, Agency Consultation and Field Preparation	2-3 weeks	$4,030
Task 2 - Stream Segment Habitat Typing	1 month	$5,550
Task 3 - Establishment of Cross Sections	2 months	$6,390
Task 4 - Stage Discharge Data Collection	4 months	$14,650
Task 5 - Data Entry	5 months	$2,080
Task 6 – Data Analysis	5 months	$8, 020
Task 7 – Report Preparation	6 months	$11,840
Task 8 – Site Specific Risk Assessment/ Agency Consultation	7-8 months	$7, 120
	Total	$59,680

AES will complete the above specified tasks for the project on a time-and-materials basis for an approximate cost of $59,680 per site for the first 10 sites. The cost for the remaining 60 NMFS-identified sites will likely be less as identified in Assumption 4 below. Labor and expenses will be billed on a monthly basis according to the AES fee schedule in effect. Refer to Exhibit B for a copy of the AES fee schedule.

Assumptions:

1. This scope of work includes a two day reconnaissance site visit with habitat mapping, a two day reconnaissance site visit for transect establishment, and five separate days for data collection for a single site.
2. It is assumed that the site(s) will be pre-selected by NMFS and no time will be spent actually identifying potential study sites.
3. While the Russian River is fairly predictable in flow regime, the Scope of Work as proposed may be significantly modified after the initial site reconnaissance surveys are conducted and on the ground field conditions such as local stream morphology and site access are fully evaluated.
4. The costs associated with Tasks 1 through 5 are set and will be required for each site annually; Tasks 6 through 8 may be reduced in cost over time as additional sites are studied and the level of technical effort to analyze and prepare reports from the data can be reduced. For planning purposes this number can be assumed to be between $45,000 and $50,000 per site after the first 10 sites have been completed at the cost identified above.

EXHIBIT A

FULLY BURDENED BILLING RATES

EMPLOYEE CATEGORY	HOURLY BILLING RATE
Principal	$260
Project Director	$175-$185
Project Manager	$165
Analyst III	$140
Analyst II	$125
Analyst I	$120
Cultural Resources Specialist	$140
Archeologist III	$130
Archeologist II	$125
Archeologist I	$110
Biologist III	$140
Biologist II	$125
Biologist I	$110
Sr. Graphics Designer	$125
Graphic Designer II	$110
Graphic Designer I	$100
Office Administrator	$100
Administrative Assistant III	$95
Administrative Assistant II	$85
Administrative Assistant I	$80

DIRECT COSTS

Postage / Overnight Mail	Actual cost + 15%
Courier Charges	Actual cost + 15%
Mileage	Federal Rate - currently $0.51 per mile + 15%
Other Direct Costs	At actual cost + 15%
Copying Charges	$0.10 per page + 15%

	Tasks	Principal	Director	Admin	Biologist	Biologist II	GIS III	GIS II		Cost per Task	Total
Task 1:	Agency Consultation and Field Preperation		2		16	8	2	2		$4,030	30
										$0	
Task 2:	Stream Segment Habitat Typing (up to 1/4 mile)				20	20				$5,300	40
	expenses									$250	
Task 3:	Establish Cross Sections (critical riffles and potential stranding zones)				20	20	4	4		$6,140	48
	expenses									$250	
Task 4:	Stage/Discharge Data Collection (five data collection events)				50	50				$13,250	100
	expenses									$1,400	
Task 5:	Data Entry			12	4	4				$2,080	20
										$0	
Task 6:	Data Analysis				40	16	2	2		$8,020	60
										$0	
Task 7:	Report Preperation	4	4	8	40	16	8	8		$11,740	88
	prints									$100	
Task 8:	Site Specific Risk Assessment/Agency Consultation (single site)				32	16	4	2		$7,120	54
										$0	
	HOURLY RATE	$260	$185	$85	$140	$125	$110	$100			Total Hours
	TOTAL HOURS	4	6	20	222	150	20	18			440
	SUBTOTAL LABOR	$1,040	$1,110	$1,700	$31,080	$18,750	$2,200	$1,800	Total Labor	$57,680	
									Total Expenses	$2,000	
									Total Cost	$59,680	

Exhibit X

25 March 2010

VIA EMAIL

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

Encl. 9

Reference: Comment Letter - AB 2121 Policy
Revised Draft North Coast Instream Flow Policy, dated February 17, 2010

Dear Chairman Hoppin and Members of the Water Board:

I have read the recently revised North Coast Instream Flow Policy which was released on February 17, 2010, and some of the accompanying documents. I wish to provide brief public comments on a selected number of topics, which are numbered below corresponding to the Section numerals of the Revised Draft Policy. However, before I discuss the specifics, I would like to address two important issues.

1. The Revised Draft Policy, the two volumes of the Response to Comments and other information recently released through the Water Board website, contain over 600 pages. It's a lot to read, digest and evaluate. Therefore, I am respectfully requesting that the public comment period be extended an additional 90 days.

2. At the August 5 and 6, 2008 workshops held in Ukiah and Santa Rosa, the Water Board and staff were apprised of the ongoing work by Brian Johnson, attorney for Trout Unlimited (TU), Peter Kiel of the law firm Ellison Schneider and Harris (ESH), and Bob Wagner of Wagner & Bonsignore Consulting Civil Engineers (W&B). These three entities had formed a "loose coalition" to establish better criteria and procedures to meet goals of salmonid passage and improved salmonid spawning habitat while simultaneously not prohibiting agricultural diversions. Mr. Wagner pointed out that his firm represented more than half of the applicants, and that TU, ESH and W&B had worked in concert for three years to develop workable rules for agriculture that also ensured streamflow protection. In particular, as a professional engineer, Mr. Wagner pointed out that the Draft Policy as written was "flawed, and would severely limit water diversions." In his view, it did not balance the water needs for fish with the agricultural needs for diversion, and that the "costs for compliance are underestimated." He went on to say, "We need a policy" and "we need clear manageable guidelines structure." Mr. Johnson of TU said, "We agree on the point that in most streams there's enough water for agriculture and for fish. The question is the method and timing of diversion."

Given this cooperation among generally adversarial entities, and with the Water Board's verbal blessing at those workshops, TU, ESH and W&B continued work for another eight months and developed their Joint Recommendations, released April 30, 2009. It covered nine topics, and they intended to write four more sections. However, the Water Board never acknowledged this work until the Response to Comments document came out, and then the Joint Recommendations were

EXHIBIT X

lightly criticized and heavily ignored. Their work was entirely discounted by the Division of Water Rights staff. TU, ESH and W&B together put in all this effort to develop the Joint Recommendations and nothing came of it; they may as well have never sat down to confer, let alone write a document.

However, there is a bit more to this story. The Water Board staff contracted with two firms, R2 Resource Consultants and Stetson Engineers, to respond in detail to the Joint Recommendations. It should be publicly noted that R2 Resource Consultants and Stetson Engineers did a thorough "trashing" of the Joint Recommendations, finding fault with nearly everything that their engineering colleagues Wagner and Bonsignore had prepared. And it also should be remembered that R2 Resource Consultants and Stetson Engineers were not independent peer reviewers of the Joint Recommendations, but rather these two companies were the very highly paid consulting firms which wrote the Scientific Basis for the original Draft Policy in August 2007. There is a profound conflict of interest. The Water Board should have hired an independent firm to evaluate the Joint Recommendations, not the firms which were contracted to write the original documents.

As you may be aware, I provided my own critique of these Joint Recommendations on September 14, 2009. While the Joint Recommendations may not be perfect, they are far more workable, scientifically sound and more defensible than the original Draft Policy, and now the Revised Draft Policy. So, my request is that the Board carefully examine the Joint Recommendations and meet with its authors to see what portions of the Joint Recommendations can be incorporated into a policy. It would be far better for anadromous fish and their habitats, and for farming for the Water Board to accept the Joint Recommendations instead of the Revised Draft Policy, and I support adoption of the Joint Recommendations.

COMMENTS SPECIFIC TO THE REVISED DRAFT POLICY

Section 2.2.1.2 Minimum Bypass Flow

The formulas for bypass flows on small watersheds have been slightly changed from the original Draft Policy, and there are now two formulas: one for watersheds less than or equal to 1 square mile and one for watersheds from 1 square mile to 321 square miles.

Concerning the watersheds of less than 1 square mile, the formula requiring an instantaneous minimum bypass flow of nine times the mean annual flow is still very restrictive to most projects, especially those high in the watershed where most diversions occur, and especially to those with watershed areas of less than about 200 acres. Without access to actual streamflow data, I can't accurately assess the percent of water that would have to be bypassed compared to total flow, but the required instantaneous bypass amount must represent around 97% to 99% of the total annual flow, and the number of days it would be permissible to divert and store water surely cannot exceed more than about 15 days per water year. None but the very smallest of ponds would ever fill.

As for the slightly larger watersheds, say 1 to 15 square miles, the new formula provides a nearly identical number of diversion days as the old formula from the original Draft Policy. I presented a table and graph in my comments of August 5, 2008 and showed that unless the watershed area is at least 10 square miles (= 6,400 acres) only a few diversion days are possible each winter. In the case of a diversion at the Soda Creek USGS gauge 11467850, there is a watershed area of 1.53 square miles. Under the Draft Policy, there would be 7 allowable diversion days, and under the Revised Draft Policy, there would be 5 days. For Willits Creek, a watershed area of 3.72 square miles, at USGS gauge 11462160, under the Draft Policy there could be no more than 5 diversion days and under the Revised Draft Policy there can be no more than 7 days of allowable diversion. Data from other locations are comparable, so the conclusion is that the new formula provides nearly identical results to the old formula, and both are so restrictive to diversion that few if any diversions will be allowed.

To sum up, the Minimum Bypass Flow requirement is a project killer to small diversions. As I wrote for the August 5, 2008 workshop, "If this policy is adopted, especially with the Minimum Bypass Flow and Maximum Cumulative Diversion requirements, there will never ever be another pond built on a small drainage." As mentioned in the previous paragraph, I provided a table and graph which showed the number of actual permissive days of diversion for a variety of watershed areas and annual stream flow rates, and I concluded, "Unless your drainage area is at least 6,400 acres or 10 square miles, you'll never be able to build a pond." I still stand by these words, the possibility of exemption from Minimum Bypass Flow requirements for projects above the Upper Limit of Anadromy notwithstanding. The exemption criteria for projects above the Upper Level of Anadromy are discussed in Appendix A.1.8.1 and A.1.8.2. The three criteria plus the analyses required in Appendix B Sections B.3.5.4, B.3.5.5 and B.3.5.6 do not appear to be viable except for a very small number of projects. Moreover, it is doubtful that the Case-by-Case exceptions found in Section 9 would be allowed except under very rare circumstances.

Section 2.2.1.3 Maximum Cumulative Diversion

As with the original Draft Policy, the Maximum Cumulative Diversion will make many projects, especially small ones, impossible to build. The reason is that many ephemeral streams contribute significant amounts of water to a pond only during and soon after large storm events. If the Minimum Bypass Flow is in place, no water may be diverted and collected until that requirement is satisfied and on an ongoing basis. Some water can be diverted after that requirement is met. However, when the Maximum Cumulative Diversion begins to apply, the window of opportunity to fill a pond is small. Small ponds high in the watersheds need the "flashy" conditions caused by intense rainfall in order to fill because of the restrictions due to the Minimum Bypass Flow. But, if the large volume of water during a rainstorm is denied to a pond because of the Maximum Cumulative Diversion, few projects will ever be built.

Section 2.2.2 Site Specific Studies

The idea looks good on paper, but it is doubtful the approach will succeed when requested by an applicant. Criteria are in general too difficult to meet.

Sections 5.0 - 5.2 Bypass System, Flow Monitoring and Reporting

While passive bypass systems are to be the norm, under special conditions, "an automated computer-controlled bypass system shall be designed, installed, and operated." One requirement of the automated computer-controlled bypass system is that, "compliance with the minimum bypass flow requirements shall be demonstrated by hourly recording using automated flow measuring devices(s). The flow data shall be recorded so that it is retrievable and viewable using commonly available computer software." It goes on to say the data must be put on a spreadsheet and sent electronically to the Water Board in tabular and chart forms.

There are two objections to the automated computer-controlled bypass system. First is excessive complexity and enormous cost. To automatically measure, record and change the bypass flow rate will require electronic sensors to measure pond volume for any given pond depth, and a sensor to measure the actual bypass flow rate just below the dam. But in addition to the sensors, there must be a switching system that activates a diesel engine or an electric pump to pump the water out of the pond at the desired rate, and not too much nor too little a rate. Pumps and valves must be automatically turned on and off and while pumping, must be adjusted to provide the exact required flow automatically by electro-mechanical means. So there must be sensors and a negative feedback system at the pump to obtain the correct rate of bypass. It would require purchasing a power source, e.g., a diesel engine or bringing in electricity. Then, one would have to buy a pump capable of pumping hundreds or even thousands of gallons per minute. Finally, there would have to be a complete control system of computers, valves, switches and much more. This is a difficult and costly problem that only a licensed engineer can attempt to solve. It is hard to give a cost estimate, but based on my own experiences I would suggest that for any individual pond of, say, 20 acre-feet capacity, this kind of system will cost at minimum $50,000 and more likely $80,000 or more. It's simply too complicated and too expensive to implement. Of course, for larger ponds, the cost will be more.

The second reason that this automated computer-controlled bypass system isn't feasible is that the Water Board staff will be overwhelmed by all the hourly recorded data it receives, even if only on the forms and spreadsheets reporting water use. Of course, if data must be submitted to the Water Board in real-time, the problem is even worse. Consider the amount of data from only 100 ponds employing this system, taking readings once per hour. There are 24 hours in a day and 365 days per year, so each pond annually delivers 8,760 data points. With 100 ponds, there are 876,000 individual data points each year, a huge amount of uninterpretable data containing very little valid and useful information.

The correct solution, as I have pointed out before, is to establish a number of USGS stream gauges at selected places on streams of interest. In this manner, valuable information may be gleaned.

Section 8.3 Continuing Authority to Amend Permits and Licenses

From the birth and early development of the North Coast Instream Flow Policy, the Division of Water Rights has taken the position both in writing and at many public meetings, that the Policy will apply only to applications for new water rights or to certain petitions. This stance has been clear through all of this prolonged process. It says so in the first paragraph of the Introduction of this Revised Draft Policy: "It [this policy] applies to applications to appropriate water, small domestic use and livestock stockpond registrations, and water right petitions." Under Section 3.3, the document repeats this sentence verbatim, "This policy applies to applications to appropriate water, small domestic use and livestock stockpond registrations, and water right petitions." In public meetings, this was reiterated many times, and staff has said the Policy would not affect existing licenses.

But now in Section 8.3 of the Revised Draft Policy, the rules are changed completely, using Water Code Sections 100 and 275, and it is clear the present intention differs from what the original Draft Policy contained and from what the Introduction and Section 3.3 of the Revised Draft Policy both state. It is manifest that the Revised Draft Policy now intends to apply to existing water rights, and with obvious intent to modify existing licenses. This is contrary to what staff has been saying for more than two years.

I can say with assurance that many landowners will view Section 8.3 as a threat. These landowners may not realize that the Water Board to some extent already has this power, but landowners will think it as a new authority. But precisely because the Water Board already has some of this authority, this language is not needed in the Revised Draft Policy. Moreover, since the Policy applies to a limited area of all or portions of only five counties, the language looks highly discriminatory with respect to the other 53 counties in the State. These Water Code Sections actually apply to the entire state and therefore should not appear in the Policy which is limited to this area. Unless, of course, it becomes the intention of the Water Board and staff to open up and modify existing water rights only in the region covered by the Policy. At the least, this topic must be clarified, but I think it is better that this section should be deleted completely.

Section 9.0 Case-by-Case Exceptions to Policy Provisions

This section is a welcome addition to the Revised Draft Policy. I sincerely hope that the Water Board staff and the Deputy Director for Water Rights will look favorably upon applicants who choose to exercise these provisions.

Thank you for your kind attention to these comments and for the opportunity to provide them.

Very truly yours,

Rudolph H. Light
P.O. Box 736
Redwood Valley, CA 95470
(707) 485-1335

Exhibit Y

Jesse Barton

From: Mandel, Carol - Ukiah, CA [Carol.Mandel@ca.usda.gov]
Sent: Thursday, June 23, 2011 10:12 AM
To: Jesse Barton
Subject: RE: NRCS cost share for ponds

The only correction to the statement below is that AWEP may have 2 years of funding left (my mistake), however, it is uncertain if funds will be allocated for the program for the last 2 years. If we do get money, it will likely be at a reduced rate due to projected federal budget cuts. In fact, we expect all our programs, including EQIP, to be significantly cut back.

Let me know if you have any other questions.

Carol Mandel
Natural Resources Conservation Service
Ukiah Field Office
(707)468-9223 x15

-----Original Message-----
From: Jesse Barton [mailto:jbarton@gallerybartonlaw.com]
Sent: Wednesday, June 22, 2011 2:42 PM
To: Mandel, Carol - Ukiah, CA
Subject: FW: NRCS cost share for ponds

Hi Carol,

Like I said, I just want to make sure I understood our conversation.

Briefly, these are the main points as I understood them:

1. The AWEP (Agricultural Water Enhancement Program) is the program that provides cost share for agricultural efficiency projects. If the project can reduce water demand on a stream to enhance/protect fishery habitat, then it can qualify for AWEP funding. An applicant must be able to document water savings to be eligible.

2. The money is not unlimited. The program is competitive and your office ranks the project based on water savings. Only some of the projects are funded each year.

3. Right now, the program funds projects on a flat rate basis. For a pond construction project, this translates (roughly) in today's dollars to about 30%-40% of the total cost. Even at this level, many applicants cannot afford to build the pond.

4. In order to be eligible for a pond construction project, the applicant must have a water right permit authorizing the storage from the SWRCB, or have some other legal basis for storing the water.

5. 2012 will be the last year for the AWEP program. There is currently no funding in place for AWEP beyond 2012.

If you could confirm, or correct, my understanding, I would greatly appreciate it. Also, I would like to be able to refer to this email in our comment letter to the SWRCB. Is this okay with you?

Thank you very much for your time.

Jesse W. Barton
Gallery & Barton, APLC
1112 I Street, Suite 240
Sacramento, CA 95814
T: (916) 444-2880
F: (916) 444-6915

EXHIBIT Y

*** ATTENTION ***
The information contained in this message may be legally privileged and confidential. It is intended to be read only by the individual or entity to whom it is addressed or by their designee. If the reader of this message is not the intended recipient, you are on notice that any distribution of this message, in any form, is strictly prohibited. If you have received this message in error, please immediately notify the sender by telephone and delete or destroy any copy of this message.

-----Original Message-----
From: Nick Bonsignore [mailto:nick@wbecorp.com]
Sent: Wednesday, June 22, 2011 1:16 PM
To: Jesse Barton
Cc: Paula Whealen; Robert Wagner
Subject: FW: NRCS cost share for ponds

Jesse - See Carol's message below.

Nick

-----Original Message-----
From: Mandel, Carol - Ukiah, CA [mailto:Carol.Mandel@ca.usda.gov]
Sent: Wednesday, June 22, 2011 9:16 AM
To: Nick Bonsignore
Subject: FW: NRCS cost share for ponds

-----Original Message-----
From: Mandel, Carol - Ukiah, CA
Sent: Wednesday, June 22, 2011 9:13 AM
To: 'nbonsignore@wbe.corp.com'
Subject: NRCS cost share for ponds

Nick, sorry about the delay in responding to your request about cost for ponds. I attached the cost list that we use when providing cost shares through our AWEP program. This last year, the cost of materials and equipment operation went up significantly due to the cost of fuel and petroleum based products (liners and pipe). Our cost share is now only about 30-40% of the total cost. Several producers canceled their AWEP applications this year after getting cost estimates from contractors - they simply couldn't afford their share of the cost.

I'm glad you are providing input to the EIR. Let me know if there's anything else I can do.

Carol Mandel
Natural Resources Conservation Service
Ukiah Field Office
(707)468-9223 x115

Exhibit Z

Linda S. Adams
Secretary for Environmental Protection

State Water Resources Control Board

Division of Water Rights
1001 I Street, 14th Floor ♦ Sacramento, California 95814 ♦ 916.341.5300
P.O. Box 2000 ♦ Sacramento, California 95812-2000
Fax: 916.341.5400 ♦ www.waterboards.ca.gov/waterrights

Arnold Schwarzenegger
Governor

Status of Pending Applications to Appropriate Water in the Counties of Marin, Napa, Sonoma, Mendocino, and Humboldt

This report has been prepared pursuant to Water Code section 1259.2.

1259.2 *(a) The board shall annually prepare a written summary, in chart form, of pending applications to appropriate water in the Counties of Marin, Napa, Sonoma, Mendocino, and Humboldt. The summary shall include a description of the status of each pending application, the actions taken in the preceding year, proposed actions for the upcoming year, and the proposed date for final action with regard to that application.*
(b) For the purposes of carrying out subdivision (a), the board may post the information described in subdivision (a) on its Web site.
(Added by Stats. 2004, Ch. 943.)

The report is available on the following web site:

http://www.waterboards.ca.gov/waterrights/water_issues/programs/coastal_streams/

Acronyms and Codes Used in California Water Code Section 1259.2 Report

Acronym	Description
BRA	Biological Resources Assessment
CEQA	California Environmental Quality Act
CFII	Cumulative Flow Impairment Index
CRA	Cultural Resources Assessment
DFG	California Department of Fish and Game
EIR	Environmental Impact Report
FWP	Final Work Plan
IS	Initial Study (for CEQA)
LSUR	Livestock Stockpond Use Registration
MND	Mitigated Negative Declaration (for CEQA)
MOU	Memorandum of Understanding (for CEQA)
NMFS	National Marine Fisheries Service
NOP	Notice of Preparation
POD	Point of Diversion
POI	Point of Interest (for Water Availability Analysis)
POU	Place of Use
PTRA	Public Trust Resources Assessment
PWP	Preliminary Work Plan
SCWA	Sonoma County Water Agency
SDUR	Small Domestic Use Registration
USACE	US Army Corps of Engineers
WAA	Water Availability Analysis
WSR	Water Supply Report

***County Codes: HUM=Humboldt, MEN=Mendocino, MRN=Marin, NAP=Napa, SON=Sonoma**

****Status Codes: A=Active, C=Waiting for information from applicant, H=Application on hold, F=Application permitted or cancelled**

***** Proposed Final Action Date is based on current staffing levels and may change substantially due to many factors including but not limited to submission of change petitions, protest resolution difficulties, waiting for submission of information by applicant, etc...**

California Water Code Section 1259.2 Report for Calendar Year 2010

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A012919C	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - analyze water use data; request WAA	2-5 YEARS
A012920B	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - analyze water use data; request WAA	2-5 YEARS
A029511	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A029512	MEN	A	Requested and received reservoir survey	Review reservoir survey; prepare staff evaluation of potential impacts to public trust resources	0-2 YEARS
A029525	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - request MOU; process with Applications 29526, 29763, 29764, 29765	2-5 YEARS
A029526	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - request MOU; process with Applications 29525, 29763, 29764, 29765	2-5 YEARS
A029760	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed. Process with Applications 30656, 31179, 31261, 31184, 29783, 31146, 30015, 31296	UNKNOWN
A029763	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - continue evironmental/public trust analysis; process with Applications 29525, 29526, 29764, 29765	2-5 YEARS
A029783	MEN	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - establish baseline; process with Applications 29760, 30656, 31179, 31261, 31184, 31146, 30015, 31296	2-5 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A029810	MEN	A	Notified of ownership change; received and commented on IS; finalized compliance plan	Resolve protests; finalize and circulate IS	0-2 YEARS
A029910	MEN	A	Received and commented on IS	Resolve protests; finalize and circulate IS	0-2 YEARS
A029911	MEN	A	Received and commented on IS	Resolve protests; finalize and circulate IS	0-2 YEARS
A030015	MEN	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - establish baseline; process with Applications 29760, 30656, 31179, 31261, 31184, 29783, 31146, 31296	2-5 YEARS
A030290	MEN	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - execute MOU once Applicant agrees to reservoir monitoring plan or cancel application	2-5 YEARS
A030448	MEN	C	Commented on IS	Finalize and circulate IS	1-2 YEARS
A030449	MEN	C	Commented on IS	Finalize and circulate IS	1-2 YEARS
A030479	MEN	C	Commented on IS; requested reservoir survey and water use information	Review reservoir survey and water use information when submitted; finalize IS	1-3 YEARS
A030492	MEN	C	Requested IS	Review BRA, CRA and IS when submitted	2-5 YEARS
A030533	MEN	C	Received supplemental hydrologic analysis; received technical memorandum; project meeting with Agent; requested project description clarification	Review project description clarification when submitted; resolve protests; finalize IS	1-3 YEARS
A030553	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - request and review WAA	2-5 YEARS
A030554	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - request and review WAA	2-5 YEARS
A030615	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - continue environmental/public trust analysis	2-5 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A030656	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed. Process with Applications 29760, 31179, 31261, 31184, 29783, 31146, 30015, 31296	UNKNOWN
A030683	MEN	C	Conducted site visit consultation with DFG/NMFS	Consultant to submit reservoir surveys; continue environmental/public trust analysis	2-5 YEARS
A030718	MEN	C	Project meeting with Agent; conducted site visit; requested bypass plan	Develop acceptable bypass plan; continue environmental/public trust analysis	1-3 YEARS
A030722	MEN	A	Project meeting with Agent/Applicant; requested project description clarification; received supplemental hydrologic analysis	Review hydrologic analysis; review project description clarification when submitted; resolve protests; finalize IS	0-2 YEARS
A030761	MEN	C	Requested and received corrected MOU, executed MOU; received and accepted FWP	Finalize and circulate IS	1-2 YEARS
A030779	MEN	A	Received stream assessment; conducted site visit	No action to be taken until staff resources available; next step - review stream assessment; continue environmental/public trust analysis	1-3 YEARS
A030780	MEN	A	Received stream assessment; conducted site visit	No action to be taken until staff resources available; next step - review stream assessment; continue environmental/public trust analysis	1-3 YEARS
A030792	MEN	A	Notified of ownership change; received and commented on IS; finalized compliance plan	Resolve protests; finalize and circulate IS	0-2 YEARS
A030794	MEN	A	Commented on IS; requested reservoir survey and water use information; received supplemental hydrologic analysis	Review supplemental hydrologic analysis; review water use information and reservoir survey when submitted; resolve protests	1-3 YEARS
A030828	MEN	C	Received and approved Sediment Monitoring Report; notified that Applicant scheduled site visit consultation with DFG; requested draft IS	Resolve protests; finalize IS	1-3 YEARS
A030859	MEN	C	Reviewed revised PTRA, requested revisions	Review revised PTRA when submitted; issue permit	1-2 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A030860	MEN	C	Requested and received PWP, commented on PWP; received request for CEQA exemption, recommended CEQA exemption; received and commented on PTRA proposal	Review revised PTRA proposal when submitted; request PTRA	1-3 YEARS
A030861	MEN	C	Staff resources not available - no action	Review IS when submitted	2-3 YEARS
A030870	MEN	C	Received and approved scope of work for stream assessment, received and commented on stream assessment	Review revised stream assessment when submitted	1-3 YEARS
A030873	MEN	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - proceed processing application or cancel	2-5 YEARS
A030877	MEN	A	Prepared POI map and submitted to DFG, DFG approved POIs; requested project description clarification	Establish baseline; review project description clarification; request WAA	2-5 YEARS
A030878	MEN	H	Prepared POI map and submitted to DFG, DFG approved POIs; requested project description clarification; Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A030892	MEN	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - review baseline; review site specific studies when submitted	2-3 YEARS
A030912	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - request and review PTRA	2-5 YEARS
A030926	MEN	F	Cancelled application	N/A	COMPLETE
A030966	MEN	A	Conducted complaint investigation; Applicant agreed to proposed conditions to resolve complaint	Resolve complaint; continue environmental/public trust analysis	2-5 YEARS
A030982	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - schedule formal field investigation; prepare Division Decision	2-5 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A030986	MEN	H	Applicant considering offstream storage versus direct diversion; application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A030987	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A030988	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - review baseline; request and review WAA	2-5 YEARS
A030994	MEN	A	Staff resources not available - no action	Resolve protests; finalize and circulate IS	0-2 YEARS
A031003	MEN	C	Project meeting with Agent; conducted site visit; requested bypass plan	Develop acceptable bypass plan; continue environmental/public trust analysis	1-3 YEARS
A031004	MEN	A	Received and reviewed revised BRA; commented on WAA; received and commented on stream assessment	Resolve protests; finalize and circulate IS	0-2 YEARS
A031040	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; Next step - review WAA	2-5 YEARS
A031057	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - process protests; request and review WAA	2-5 YEARS
A031059	MEN	A	Received and reviewed revised baseline; received BRA, requested and received revisions; received and accepted WAA; received CRA; received stream assessment, requested and received revisions	Continue environmental/public trust analysis	1-3 YEARS
A031060	MEN	A	Received and reviewed revised baseline; received BRA, requested and received revisions; received and accepted WAA; received CRA; received stream assessment, requested and received revisions	Continue environmental/public trust analysis	1-3 YEARS
A031080	MEN	C	Received supplemental hydrologic analysis; received technical memorandum; project meeting with Agent; requested project description clarification	Review project description clarification when submitted; resolve protests; finalize IS	1-3 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031085	MEN	H	Received revised baseline; Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A031086	MEN	H	Received and granted request for extension to submit baseline; received and requested revised baseline; requested project description clarification; application on hold pending Board approval of frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A031087	MEN	C	Received and granted request for extension to submit revised baseline; received revised baseline; requested project description clarification and revised baseline	Review revised baseline and project description clarification when submitted; continue environmental/public trust analysis	2-5 YEARS
A031091	MEN	H	Received request for extension of time to submit request for CEQA exemption, received exemption request and project amendments; Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A031092	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A031093	MEN	H	Processed protests; Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A031105	MEN	A	Received request for extension of time to submit request for CEQA exemption, received exemption request and project amendments; no available staff resources for follow-up	Review request for CEQA exemption; continue environmental/public trust analysis	2-5 YEARS
A031135	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - continue environmental/public trust analysis	2-5 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031138	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A031139	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A031140	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - establish baseline	2-5 YEARS
A031141	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - establish baseline; request WAA	2-5 YEARS
A031159	MEN	A	Processed protests	Establish baseline; request WAA	2-5 YEARS
A031179	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed; process with Applications 29760, 30656, 31261, 31184, 29783, 31146, 30015, 31296	UNKNOWN
A031184	MEN	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - establish baseline; process with Applications 29760, 30656, 31179, 31261, 29783, 31146, 30015, 31296	2-5 YEARS
A031250	MEN	C	Received petition for change; received supplemental hydrological analysis; received and commented on IS; received and commented on supplemental BRA	Resolve protests; review supplemental hydrological analysis; finalize IS	0-2 YEARS
A031253	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A031255	MEN	A	Received revised request for CEQA exemption, recommended CEQA exemption; received reservoir survey; prepared staff evaluation of potential impacts to public trust resources	Clarify POU; resolve protests; finalize staff evaluation of potential impacts to public trust resources; draft permit	1-2 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031258	MEN	C	Commented on WAA; requested reservoir surveys	Continue environmental/public trust analysis	2-5 YEARS
A031259	MEN	C	Commented on POD 3 assessment	Continue environmental/public trust analysis	2-5 YEARS
A031260	MEN	C	Commented on WAA; requested reservoir surveys	Continue environmental/public trust analysis	2-5 YEARS
A031261	MEN	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - establish baseline; process with Applications 29760, 30656, 31179, 31184, 29783, 31146, 30015, 31296	2-5 YEARS
A031282	MEN	A	Notified of change in Agent; provided status on project to Applicant	Request and review WAA	2-5 YEARS
A031296	MEN	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - establish baseline; process with Applications 29760, 30656, 31179, 31261, 31184, 29783, 31146, 30015	2-5 YEARS
A031305	MEN	C	Received and approved scope of work for stream assessment; accepted baseline	Review stream assessment when submitted; continue environmental/public trust analysis	1-3 YEARS
A031311	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - schedule formal field investigation and prepare Division Decision	2-5 YEARS
A031315	MEN	A	Staff resources not available - no action	Establish baseline	2-5 YEARS
A031336	MEN	A	Received and commented on revised WAA; requested timetable on coordinating site specific studies	Review timetable for completing site specific studies; continue environmental/public trust analysis	2-5 YEARS
A031339	MEN	A	Received baseline; received WAA, requested revised WAA	Review baseline; review revised WAA when submitted	2-5 YEARS
A031383	MEN	A	Sent draft permit to Applicant; received comments on draft permit; revised draft permit	Issue permit	0-1 YEAR

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031386	MEN	A	Received and commented on WAA; conducted site visit; received baseline verification; received stream assessment	Review baseline and stream assessment; continue environmental/public trust analysis	2-5 YEARS
A031387	MEN	A	Staff resources not available - no action	Review baseline; request WAA	2-5 YEARS
A031398	MEN	C	Received and commented on WAA; received project amendments; reviewed and requested revised baseline; notified Agent that petition required for requested amendments	Review petition and revised baseline when submitted; continue environmental/public trust analysis	2-5 YEARS
A031399	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A031418	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - process protests; review baseline; request WAA	2-5 YEARS
A031426	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - establish baseline; request WAA	2-5 YEARS
A031434	MEN	C	Project meeting with Agent/Applicant; requested project description clarification	Review project description clarification when submitted; resolve protests; finalize IS	0-2 YEARS
A031435	MEN	C	Notified of ownership change; received fisheries biologist resume; provided consultant with clarification of the Instream Flow Policy; requested WSR	Review WSR when submitted; conduct stream assessment	1-3 YEARS
A031437	MEN	C	Received MOU; notified that portion of property sold which split project; no available staff resources for follow-up	No action to be taken until staff resources available; next step - consultant to determine how property owners wish to proceed; continue environmental/public trust anlaysis	2-5 YEARS
A031445	MEN	A	Received summary of fish habitat in Walker Creek; received PTRA (not requested); requested DFG's comments on PTRA	No action to be taken until staff resources available; next step - review requested CEQA exemption; review PTRA if appropriate; review WAA	2-5 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031446	MEN	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - establish baseline; process with Applications 29760, 30656, 31179, 31261, 31184, 29783, 30015, 31296	2-5 YEARS
A031447	MEN	C	Received and commented on PTRA; requested reservoir survey; received field notes to accompany PTRA	Review revised PTRA and reservoir survey when submitted; continue environmental/public trust anlaysis	1-3 YEARS
A031461	MEN	A	Received and commented on WAA; conducted site visit consultation with DFG/NMFS	Prepare staff evaluation of potential impacts to public trust resources; draft permit	0-2 YEAR
A031464	MEN	A	Staff resources not available - no action	Establish baseline; request WAA	2-5 YEARS
A031465	MEN	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A031467	MEN	C	Requested and received status on PTRA proposal; received and commented on PTRA proposal	Review PTRA when submitted	1-3 YEARS
A031501	MEN	A	Received and commented on BRA/CRA; requested and received baseline; received wetland delineation; received revised WAA	Review revised WAA and baseline; review revised BRA and IS when submitted	1-3 YEARS
A031504	MEN	C	Staff requested status re: whether Applicants intend to continue processing application or file LSUR; notified that Applicant intends to file LSUR	Proceed with processing application or cancel	2-5 YEARS
A031513	MEN	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - process protests; review baseline; request WAA	2-5 YEARS
A031519	MEN	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - review baseline verification when submitted; review WAA proposal	2-5 YEARS
A031553	MEN	A	Received and commented on PWP	Request and review WAA	2-5 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031554	MEN	A	Received and commented on PWP	Request and review WAA	2-5 YEARS
A031661	MEN	C	No action; Applicant acting as CEQA lead agency	Provide input as CEQA responsible agency	2-5 YEARS
A031662	MEN	C	No action; Applicant acting as CEQA lead agency	Provide input as CEQA responsible agency	2-5 YEARS
A031739	MEN	A	Noticed application; processed protests	Continue processing protests; establish baseline; request WAA	2-5 YEARS
A031792	MEN	A	Issued public notice; processed protests; project meeting	Establish baseline; request and review WAA	2-5 YEARS
A031804	MEN	A	Issued public notice; processed protests; received request for cancellation; drafted cancellation order	Cancel application	0-1 YEAR
A031838	MEN	A	Received and accepted application; issued public notice; processed protests; requested MOU	Establish baseline; request and review WAA; execute MOU	2-5 YEARS
A031843	MEN	A	Received and accepted application; received project amendments; issued public notice; processed protests; conducted site visit; requested MOU	Establish baseline; request and review WAA; execute MOU	2-5 YEARS
A031655	MRN	A	No action; City acting as CEQA lead agency	Provide input as CEQA responsible agency	2-5 YEARS
A031656	MRN	A	No action; City acting as CEQA lead agency	Provide input as CEQA responsible agency	2-5 YEARS
A029687	NAP	A	Requested and received final IS; requested and received Applicant's approval of permit terms	Circulate IS; issue permit	0-1 YEARS
A029686	NAP	A	Requested and received final IS; requested and received Applicant's approval of permit terms	Circulate IS; issue permit	0-1 YEAR
A029800	NAP	A	Received revised IS; no available staff resources for follow-up	Finalize and circulate IS	1-3YEARS
A029801	NAP	A	Received revised IS; no available staff resources for follow-up	Finalize and circulate IS	1-3 YEARS
A029852	NAP	F	Permitted project	N/A	COMPLETE

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A029853	NAP	A	Staff resources not available - no action	Continue environmental/public trust analysis	2-5 YEARS
A029865	NAP	C	Notified of ownership change; staff resources not available - no action	Review geology report when submitted; continue environmental/public trust analysis	2-5 YEARS
A029929	NAP	A	Received and commented on PWP	Request and review WAA	2-5 YEARS
A029951	NAP	A	Staff resources not available - no action	Finalize IS or cancel application	1-3 YEARS
A030012	NAP	H	On hold pending completion of IS	On hold pending completion of IS	UNKNOWN
A030144	NAP	A	Resolved protests	Review PTRA; issue permit	0-1YEARS
A030252	NAP	F	Permitted project	N/A	COMPLETE
A030253	NAP	F	Permitted project	N/A	COMPLETE
A030322	NAP	A	Received and commented on IS	Finalize and circulate IS	1-3 YEARS
A030323	NAP	A	Received and commented on IS	Finalize and circulate IS	1-3 YEARS
A030384	NAP	C	Consultant terminated MOU; requested new MOU	Execute MOU or cancel application	1-3 YEARS
A030545	NAP	A	Received WAA; no available staff resources for follow-up	Review WAA; continue environmental/public trust analysis	2-5 YEARS
A030546	NAP	A	Received WAA; no available staff resources for follow-up	Review WAA; continue environmental/public trust analysis	2-5 YEARS
A030594	NAP	C	Received proposed MND; contacted Napa County and submitted written comments on proposed MND; Napa County acting as CEQA lead agency	Continue environmental/public trust analysis or cancel application	2-5 YEARS
A030597	NAP	A	Reviewed stream assessment	Schedule meeting with consultant regarding stream assessment; continue environmental/public trust analysis	1-3 YEARS
A030605	NAP	H	Notified of change in Agent; on hold pending completion of IS	On hold pending completion of IS	UNKNOWN

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A030655	NAP	A	Received cancellation request; prepared cancellation order	Cancel application	0-1 YEAR
A030674	NAP	C	Reviewed and commented on WAA; requested and received project description clarification; requested and received baseline, requested baseline clarification	Review baseline clarification when submitted; continue environmental/public trust analysis	2-5 YEARS
A030679	NAP	A	Reviewed and commented on WAA, sent WAA to trustee agencies	Continue environmental/public trust analysis	2-5 YEARS
A030698	NAP	C	Received and reviewed scope of work for fisheries assessment; sent consultation request to DFG/NMFS; conducted site visit consultation; commented on draft agency consultation summary; discussed next steps with consultant	Consultant to recommend site specific studies or project modifications; continue environmental/public trust analysis	1-3 YEARS
A030725	NAP	A	Staff resources not available - no action	Review revised proposed protocol for evaluation of effects of diversion	2-5 YEARS
A030737	NAP	A	Commented on WAA; requested scope of work for site specific studies; received and commented on CRA	Review BRA and baseline	1-3 YEARS
A030756	NAP	A	Staff resources not available - no action	Review revised proposed protocol for evaluation of effects of diversion	2-5 YEARS
A030856	NAP	C	Received project amendments; notified Applicant a petition required for requested amendment; requested verification for CEQA exemption request; prepared POI map and submitted to DFG, DFG approved POIs	Review verification for requested CEQA exemption; notice petition when submitted (if necessary); establish baseline	2-5 YEARS
A030929	NAP	A	Provided Applicant status of application; conducted site visit consultation with DFG/NMFS; prepared staff evaluation of potential impacts to public trust resources and drafted permit; Applicant agreed to proposed permit terms	Issue permit	0-1 YEARS
A030950	NAP	H	Application on hold pending outcome of Application 29853	Application on hold pending outcome of Application 29853	UNKNOWN

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A030965	NAP	H	Application on hold per Applicant's request	Continue processing application or cancel	UNKNOWN
A031034	NAP	A	Received scope of work for stream assessment, discussed and approved scope; received revised BRA, requested and received revisions; conducted site visit consultation with DFG/NMFS; received stream assessment	Review stream assessment; continue environmental/public trust analysis	1-3 YEARS
A031279	NAP	A	Received and commented on WAA; conducted site visit	Establish baseline; continue environmental/public trust analysis	2-5 YEARS
A031312	NAP	A	Requested project description, revised baseline, reservoir survey, and revised WAA; consultant terminated MOU	Terminate MOU; enter into new MOU or cancel	2-5 YEARS
A031452	NAP	A	Conducted site visit; prepared POI map and submitted to DFG, DFG approved POIs; requested and received WAA	Review WAA; continue environmental/public trust analysis	1-3 YEARS
A031533	NAP	A	Received and commented on PWP; requested and received baseline	Review baseline; request WAA	2-5 YEARS
A031548	NAP	C	Commented on IS	Finalize IS	1-3 YEARS
A031549	NAP	A	Issued public notice; processed protests	Establish baseline; request WAA	1-3 YEARS
A031550	NAP	A	Processed protests	Establish baseline; request WAA	1-3 YEARS
A031556	NAP	A	Staff resources not available - no action	Establish baseline	2-5 YEARS
A031560	NAP	A	Staff resources not available - no action	Establish baseline	1-3 YEARS
A031635	NAP	A	Received and commented on WAA; conducted site visit consultation with DFG/NMFS; received stream assessment; reviewed request for CEQA exemption; requested PTRA proposal	Review stream assessment; review PTRA proposal when submitted	1-3 YEARS
A031670	NAP	A	Received and executed MOU; received PWP	Comment on PWP; establish baseline; request WAA	2-5 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031694	NAP	F	Cancelled application	N/A	COMPLETE
A031715	NAP	A	Processed protests	Establish baseline; request and review WAA	1-3 YEARS
A031730	NAP	A	Processed protests; requested MOU; received and denied cancellation of application request; received request for CEQA exemption, requested and received verification of CEQA exemption, recommended CEQA exemption; received PTRA proposal	Review PTRA proposal; request PTRA and WAA	2-5 YEARS
A031736	NAP	A	Processed protests	Establish baseline; request WAA	2-5 YEARS
A031817	NAP	A	Received and accepted application; issued public notice; processed protests	Establish baseline; request and review WAA	2-5 YEARS
A031824	NAP	A	Received and accepted application; issued public notice; processed protests; requested MOU	Establish baseline; request and review WAA; execute MOU	2-5 YEARS
A031840	NAP	A	Received and accepted application; issued public notice; processed protests; conducted site visit	Provide input as CEQA responsible agency; request and review WAA	2-5 YEARS
A029381	SON	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - review IS when submitted	2-5 YEARS
A029705	SON	F	Cancelled application	N/A	COMPLETE
A029706	SON	F	Cancelled application	N/A	COMPLETE
A029708	SON	F	Cancelled application	N/A	COMPLETE
A029737	SON	H	On hold pending outcome of SCWA EIR	On hold pending outcome of SCWA EIR	UNKNOWN
A029784	SON	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - clarify project description; continue environmental/public trust analysis	2-5 YEARS
A029983	SON	A	Received stream assessment; no available staff resources for follow-up	No action to be taken until staff resources available; next step -review stream assessment; continue environmental/public trust analysis	2-5 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A030126	SON	C	Application temporarily on hold pending outcome of upstream applications; notified Applicant that application can be processed (no longer on hold); requested proof of posting	Continue environmental/public trust analysis	3-5 YEARS
A030181	SON	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - review stream assessment and PTRA proposal when submitted	2-5 YEARS
A030186	SON	C	Received and commented on hydrological connectivity study, requested comments from DFG	Review DFG's comments on hydrological connectivity study when submitted; draft permit	0-1 YEAR
A030223	SON	A	Requested revised BRA and IS; received and commented on botanical surveys; received revised baseline	Review revised BRA and IS when submitted; review revised baseline	1-3 YEARS
A030259	SON	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - continue environmental/public trust analysis; evaluate possible onstream reservoir mitigation	2-5 YEARS
A030336	SON	C	Requested status of stream assessment	Review stream assessment when submitted	1-3 YEARS
A030368	SON	C	Requested daily analysis	Review daily analysis when submitted	2-5 YEARS
A030369	SON	C	Requested daily analysis	Review daily analysis when submitted	2-5 YEARS
A030405	SON	C	Requested daily analysis	Review daily analysis when submitted	2-5 YEARS
A030429	SON	A	Requested revised BRA; received stream assessment	Review stream assessment; review revised BRA when submitted	1-3 YEARS
A030558	SON	C	Received EIR schedule; Applicant acting as CEQA lead agency	Provide input as CEQA responsible agency	3-5 YEARS
A030579	SON	H	Application on hold pending completion of IS for Application 30558	Application on hold pending completion of IS for Application 30558	UNKNOWN

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A030583	SON	C	Completed review of WAA, requested Agent to forward WAA to consultant; requested project meeting	Continue environmental/public trust analysis	2-5 YEARS
A030592	SON	H	Application on hold pending completion of IS for Application 30558	Application on hold pending completion of IS for Application 30558	UNKNOWN
A030663	SON	C	Staff resources not available - no action	Review WAA when submitted	2-5 YEARS
A030687	SON	A	Conducted site visit consultation with DFG/NMFS; requested reservoir surveys; requested and received revised stream assessment	Review revised stream assessment and baseline	2-5 YEARS
A030688	SON	A	Conducted site visit consultation with DFG/NMFS; requested reservoir surveys; requested and received revised stream assessment	Review revised stream assessment and baseline	2-5 YEARS
A030711	SON	F	Received cancellation request; cancelled application	N/A	COMPLETE
A030730	SON	A	Staff resources not available - no action	Request and review WAA; continue environmental/public trust analysis	2-5 YEARS
A030744	SON	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - review WAA; begin environmental/public trust analysis	2-5 YEARS
A030745	SON	A	Received and commented on revised water depth/velocity study, received and accepted revisions; conducted site visit consultation with DFG/NMFS	Request and review IS	0-2 YEARS
A030781	SON	A	Received petition for change; no available staff resources for follow-up	No action to be taken until staff resources available; next step - review petition for change; continue environmental/public trust analysis	1-3 YEARS
A030782	SON	A	Reviewed stream assessment	Schedule meeting with consultant regarding stream assessment; continue environmental/public trust analysis	2-5 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A030787	SON	C	Received and commented on CRA; requested supplemental botanical surveys	Review supplemental botanical surveys when submitted; continue environmental/public trust analysis	1-3 YEARS
A030796	SON	A	Received stream assessment and BRA; no available staff resources for follow-up	No action to be taken until staff resources available; next step - review stream assessment and BRA	1-3 YEARS
A030798	SON	A	Received and commented on revised WAA; requested and received baseline; received project amendments	Review baseline; continue environmental/public trust analysis	2-5 YEARS
A030800	SON	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - review baseline and scope of work for stream assessment	2-5 YEARS
A030802	SON	H	Application on hold pending SDUR clearance	Cancel application if SDUR clearance is received	UNKNOWN
A030805	SON	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - review scope of work for stream assessment; review stream assessment when submitted	2-5 YEARS
A030806	SON	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - continue environmental/public trust analysis	2-5 YEARS
A030807	SON	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - continue processing protests; continue environmental/public trust analysis	2-5 YEARS
A030879	SON	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - review revised baseline when submitted; request WAA	2-5 YEARS
A030880	SON	H	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	Application on hold pending Board approval of pending frost protection regulations in Russian River watershed	UNKNOWN
A030882	SON	F	Permitted project	N/A	COMPLETE

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A030954	SON	A	Received PWP; received project amendments; received request for CEQA exemption; no available staff resources for follow-up	No action to be taken until staff resources available; next step - review PWP, project amendments, and request for CEQA exemption	2-5 YEARS
A030955	SON	A	Received PWP; no available staff resources for follow-up	No action to be taken until staff resources available; next step - review PWP; establish baseline	2-5 YEARS
A030981	SON	C	Staff resources not available - no action	No action to be taken until staff resources available; next step - SCWA to continue environmental analysis and finalize EIR	2-5 YEARS
A030991	SON	A	Reviewed stream assessment	Schedule meeting with consultant regarding stream assessment; continue environmental/public trust analysis	2-5 YEARS
A031021	SON	A	Received and commented on stream assessment; received and commented on final WAA; prepared daily analysis; requested consultation with DFG/NMFS; conducted site visit consultation with DFG/NMFS; commented on IS	Finalize and circulate IS; issue permit	0-1 YEARS
A031033	SON	A	Received BRA; no available staff resources for follow-up	Review BRA; request draft IS	2-5 YEARS
A031049	SON	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - continue environmental/public trust analysis	2-5 YEARS
A031050	SON	A	Received IS; no available staff resources for follow-up	No action to be taken until staff resources available; next step - finalize and circulate IS	1-3 YEARS
A031056	SON	A	Staff resources not available - no action	No action to be taken until staff resources available; next step - review scope of work for stream assessment; review stream assessment when submitted	2-5 YEARS
A031095	SON	A	Received stream assessment, requested and received revised stream assessment; received project amendments; received reservoir survey; received baseline; received POD and bypass compliance plan studies; conducted site visit	Review revised stream assessment, POD and bypass compliance plan studies and baseline; review draft IS when submitted	0-2 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031149	SON	A	Received project amendments; no available staff resources for follow-up	Request and review scope of work for site specific studies	2-5 YEARS
A031187	SON	F	Received cancellation request; cancelled application	N/A	COMPLETE
A031254	SON	C	Received baseline, requested and received revisions, requested further clarification; conducted site visit consultation with DFG/NMFS; processed protests	Continue environmental/public trust analysis; finalize baseline	1-3 YEARS
A031256	SON	H	Application on hold per Applicant's request	Application on hold per Applicant's request	UNKNOWN
A031262	SON	C	Received and commented on revised baseline; requested reservoir capacity clarification	Continue to process application or cancel and re-file to cover additional storage	3-5 YEARS
A031300	SON	A	Received and commented on baseline; received and commented on scope of work for stream assessment; received request for CEQA exemption	Review requested CEQA exemption; review stream assessment when submitted	2-5 YEARS
A031307	SON	F	Cancelled application	N/A	COMPLETE
A031323	SON	C	Received request for CEQA exemption, recommended CEQA exemption; received and approved PTRA proposal	Conduct site visit; review PTRA when submitted	1-2 YEARS
A031373	SON	C	Commented on and finalized IS; sent proposed permit terms to Applicant for approval	Circulate IS; issue permit	0-1 YEARS
A031385	SON	C	Commented on baseline and BRA; requested reservoir surveys	Review revised baseline, BRA and reservoir surveys when submitted; continue environmental/public trust analysis	2-5 YEARS
A031507	SON	A	Requested revised BRA; received stream assessment	Review stream assessment; review revised BRA when submitted	1-3 YEARS
A031521	SON	C	Commented on revised stream assessment and BRA	Review revised BRA and stream assessment when submitted	0-2 YEARS
A031567	SON	A	Received revised WAA and pump test proposal; no available staff resources for follow-up	Review revised WAA and pump test proposal	2-5 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031616	SON	A	Received PTRA proposal; no available staff resources for follow-up	No action to be taken until staff resources available; next step - review PTRA proposal; request PTRA	2-3 YEARS
A031617	SON	A	Received project amendments; received request for CEQA exemption, requested verification to support requested exemption; Applicant notified petition for change required for requested changes, received petition for change	Complete review of requested CEQA exemption; notice petition for change (if necessary); process protests	2-5 YEARS
A031618	SON	A	Notified of ownership change; staff resources not available - no action	Establish baseline; request and review WAA	2-5 YEARS
A031620	SON	A	Reviewed and requested revised WAA, received and commented on revised WAA; received PTRA	Review PTRA; continue environmental/public trust analysis	1-3 YEARS
A031621	SON	A	Prepared POI map and submitted to DFG	Request and review WAA	2-5 YEARS
A031622	SON	A	Received and commented on WAA; received PTRA	Review PTRA; continue environmental/public trust analysis	1-3 YEARS
A031623	SON	H	Requested Applicant to identify if project modifications will be pursued or additional studies undertaken; received upstream channel survey (not requested); received revised WAA; received and granted request to suspend processing of application	Continue processing application or cancel	0-1 YEAR
A031629	SON	A	Received PWP; received POI map; no available staff resources for follow-up	No action to be taken until staff resources available; next step - review PWP; request and review WAA/WSR	2-5 YEARS
A031719	SON	A	Received and reviewed requested volume reduction; received and requested revised WAA, received revised WAA; received and commented on stream assessment	Review revised WAA; continue environmental/public trust analysis	1-3 YEARS
A031735	SON	A	Processed protests; requested and received baseline	Review baseline; request and review WAA	1-3 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031737	SON	A	Requested and received reservoir survey; received certified reservoir area capacity calculations and clarification	Complete review of requested CEQA exemption; continue processing protests; request and review WAA	2-5 YEARS
A031738	SON	A	Noticed application; processed protests	Continue processing protests; establish baseline; request WAA	2-5 YEARS
A031740	SON	A	Processed protests; executed MOU; received and commented on PWP; prepared and submitted POI map to DFG, DFG approved POIs; requested and received WAA; received baseline; requested reservoir surveys	Review WAA; review baseline when reservoir surveys submitted	1-3 YEARS
A031743	SON	A	Staff resources not available - no action	Notice application; process protests; establish baseline	2-5 YEARS
A031745	SON	A	Requested MOU	Establish baseline; execute MOU	2-5 YEARS
A031746	SON	A	Requested MOU	Establish baseline; execute MOU	2-5 YEARS
A031811	SON	A	Received and accepted application; issued public notice; processed protests; conducted site visit consultation with DFG/NMFS; received request for and recommend CEQA exemption; prepared POI map and submitted to DFG; received and commented on PTRA proposal	Request and review WAA; review PTRA proposal when submitted	1-3 YEARS
A031813	SON	A	Received and accepted application; issued public notice; processed protests; requested MOU	Establish baseline; request and review WAA; execute MOU	2-5 YEARS
A031818	SON	A	Received and accepted application; issued public notice; processed protests; requested MOU	Establish baseline; request and review WAA; execute MOU	2-5 YEARS
A031834	SON	A	Received and accepted application; issued public notice; processed protests; conducted site visit consultation with DFG/NMFS; received request for CEQA exemption, recommended CEQA exemption	Request and review WAA	1-3 YEARS

Application Number	County	Status	Actions Taken for 2010	Actions Planned for 2011	Planned Final Action Date
A031835	SON	A	Received and accepted application; issued public notice; processed protests; requested MOU	Establish baseline; request and review WAA; execute MOU	2-5 YEARS
A031836	SON	A	Received and accepted application; issued public notice; processed protests	Establish baseline; request and review WAA	2-5 YEARS

Total Applications: 253