UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
777 Sonoma Ave., Room 325
Santa Rosa, CA 95404-4731

LATE COMMENT

November 10, 2009

In response refer to:
SWR/F/SWR3:DH

Charles Hoppin, Chairman
State Water Resources Control Board
Post Office Box 100
Sacramento, California 95812-0100

Dear Mr. Hoppin,

Thank you for the opportunity to provide recommendations for actions regarding water diversions for the purposes of frost protection in Mendocino and Sonoma counties. NOAA's National Marine Fisheries Service (NMFS) is responsible for administration of the Federal Endangered Species Act (ESA) as it applies to anadromous salmonids. This responsibility includes working with the State Water Resources Control Board (SWRCB) to resolve water resource issues in concert with conservation of threatened and endangered species (ESA 2(c)(2)).

Since July 2008, our agency has been facilitating efforts to ameliorate the threat of frost protection to federally Threatened and Endangered salmonids in the Russian River basin via the Frost Protection Task Force (FPTF). In anticipation of SWRCB action on this issue, we asked FPTF members to submit written proposals for managing frost protection activities by September 17, 2009. Enclosed for your consideration are two reports constituting our response to these proposals and our assessment of the remaining threat to salmonids, respectively.

Although we ultimately find the proposals to be insufficient to fully address this threat, we wish to acknowledge the substantial efforts of participating wine grape growers and others have contributed to this process. In particular, the coalition of stakeholders in Mendocino County, referred to as the Upper Russian River Stewardship Alliance, have been exceptionally proactive in implementing tangible conservation actions, including the compensatory release program at the Coyote Dam facility and the construction of off-channel ponds to decrease demands for direct diversions of water from the mainstem Russian River.

Another exemplary effort comes from the Russian River Property Owner's Association. They demonstrated leadership in monitoring stream flows and integrating that information into a transparent decision-making process for water use management. The third proposal, submitted by the Sonoma County Frost Protection Resources Protection Group, is notable for its watershed-scale inventory of water use as a foundation for management.

Despite progress shown by each group, the scope of the frost protection threat is beyond the ability of any of these organizations to manage on a strictly voluntary basis. As our threat assessment report explains, the hydrologic impacts are acute and consistently associated with vineyard development, which is widespread throughout the basin. Although, there are likely examples of vineyards that have no such impacts, the absence of data does not allow us to support that conclusion as a generality. To the contrary, a review of the scientific literature supports our position that vineyard development, to the degree seen in the basin, likely poses a substantial risk to threatened and endangered salmonids.

The written proposals, as submitted for our review, are not sufficient in several respects. First, while there are many plans, we have little evidence of tangible conservation actions being implemented in tributary streams. Additionally, proposals for monitoring tributaries are not sufficient to address the spatial scale of the threat. Conservation and monitoring in tributaries is critical because these are the areas where impacts of water diversions for frost protection are likely most acute, and where the majority of the salmonid habitat is located.

Second, none of the proposed governing bodies possess the authority or willingness to ensure full compliance with the proposed activities. The authority and responsibility to enforce limits on water diversions for the protection of public trust resources lie with your agency. Without a mechanism to enforce such limits, achieving sufficient participation to effectively address a threat on this scale is unlikely.

Finally, managing water use for frost protection - while not impacting salmonids - will require a level of coordination, at the basin scale, not yet demonstrated. Providing for a comprehensive water availability and allocation process in all the tributaries and in affected portions of the mainstem is well beyond the scope of any of the proposals. Yet, such a comprehensive solution is appropriate to the scale of the issue.

Based on the above considerations, we recommend the SWRCB implement water use regulations to fully address frost protection impacts to federally threatened and endangered salmonids. If you have any questions or comments concerning the contents of this letter, please contact David Hines at (707) 575-6098.

Sincerely,

T. A. Edmondson (for)

Steven A. Edmondson
Northern California Habitat Supervisor
Habitat Resource Division

Enclosures:

A. Draft -- Review of Proposals to Address Frost Protection Impacts to Salmonids in the Russian River Watershed (November 18, 2009)

B. Draft -- Frost Protection Threat Assessment for Threatened and Endangered Salmonids in the Russian River Watershed (November 18, 2009)

C. NMFS Standards for Success Provisional Criteria for Evaluating the Success of Frost protection Task Force Efforts (NMFS 2009)

cc: Charles Armor, Regional Manager, Bay Delta Region, California Department of Fish and Game
Dick Butler, Santa Rosa Area Office Supervisor, Protected Resources Division, NMFS
Katherine Kuhlman, Executive Officer, North Coast Regional Water Quality Control Board
Dan Torquemada, NOAA Office of Law Enforcement

Enclosure A

DRAFT

Review of Proposals to Address Frost Protection Impacts to Salmonids in the Russian River Watershed

Prepared for the State Water Resources Control Board Public Workshop on Frost Protection, November 18, 2009

National Marine Fisheries Service
Santa Rosa Area Office
777 Sonoma Avenue
Santa Rosa, California

November 10, 2009

Frost Protection Taskforce

In response to observed mortalities of listed salmonids associated with frost protection irrigation in the Russian River, NOAA's Office of Law Enforcement established a Frost Protection Task Force (FPTF) in July of 2008. The mission of the FPTF was to develop a collaborative forum with multiple stakeholder interests to address this threat. While progress was being made in 2008, it was not sufficiently developed to result in tangible solutions in time for the 2009 frost season. As a result, the National Marine Fisheries Service (NMFS)[1] asked the State Water Resource Control Board (SWRCB) to issue emergency regulations to protect steelhead, coho salmon, and Chinook salmon in the Russian River basin. At a Public Workshop held on April 7, 2009, the SWRCB declined to issue regulation and asked NMFS to continue working with stakeholders to create a non-regulatory resolution. Due to the urgency to have threat amelioration plans in place for the 2010 frost season, NMFS subsequently requested final proposals be submitted to the FPTF by September 17, 2009. This document summarizes our agency's evaluation of those proposals and provides recommendations to the SWRCB regarding the need for regulatory action.

Our review of the proposals is based primarily on the criteria for evaluating the success of FPTF efforts, which we presented to the FPTF on August 13, 2009 (Attachment A). The NMFS criteria are organized as presented below:

1. Conservation actions
    a. Short-term: actions that will achieve results by 2010
    b. Long-term: enduring solutions that will avoid impact to salmonids
    c. Planning
        i. Water budgeting
            1. Estimate supply and demand at subwatershed scale
            2. Use results to support conservation strategies
        ii. Land use planning
    d. Oversight/Participation
        i. Secure full participation
        ii. Establish a decision protocol for coordinating diversions
        iii. Monitor and report on compliance
2. Effectiveness monitoring
    a. Streamflow monitoring
    b. Water use monitoring
3. Transparency
    a. Full disclosure
    b. Independent data management
    c. Open decision-making

[1] NMFS Habitat Conservation and Protected Resources divisions are providing technical assistance to NOAA's Office of Law Enforcement in the Frost Protection Task Force.

Two separate plans for self-governance to address frost protection impacts were developed by vineyard stakeholders and presented to NMFS in September 2009, one from the Upper Russian River Stewardship Alliance (URSA) covering Mendocino County (URSA 2009) and another from the Sonoma County Frost Protection Resources Protection Group (RPG 2009). A third proposal was submitted in late October 2009 by the Russian River Property Owners Association (RRPOA 2009). NMFS reviewed the proposals to evaluate their adequacy in addressing the impacts of frost protection practices on federally threatened and endangered salmonids in the Russian River watershed. We used the NMFS criteria as the basis for our evaluation of each proposal, and we have structured our comments accordingly.

Review of the Frost Protection Plan for the Upper Russian River Sustainability Alliance

Conservation actions

URSA has made substantial progress toward developing short-term and long-term actions to reduce the effects of frost protection on streamflow in the mainstem Russian River. More effort is needed to address the effects of frost protection on tributaries in Mendocino County.

Short-Term Actions

The program to release water from Lake Mendocino to offset demand from direct diversions in the mainstem Russian River (*i.e.*, compensatory releases) is a significant conservation action that makes tangible improvements to the observed flow deviations associated with frost protection impacts. These actions have become more effective as forecasting, communication, and experience have refined the process. Compensatory releases have reduced flow deviations by up to 50%.

While laudable, compensatory releases only partially mitigate impacts on mainstem flows and represent an interim measure to be used until long-term solutions are implemented. These actions may lead to their own incidents of stranding because flows on the descending limb of the compensatory release decrease at the same rate (although a lesser magnitude) as the unmitigated scenario that was correlated with stranding mortalities of juvenile steelhead (See figures 1 and 2 in URSA 2009). While compensatory releases are preferable compared to the unmitigated scenario, continued rapid flow reductions present limitations to their effectiveness as a permanent solution.

A number of other activities were proposed for 2010, but these are either addressed elsewhere (*e.g.*, under monitoring) or we did not consider them to be tangible conservation actions. No short-term actions were proposed for tributary streams.

Long-Term Actions

URSA's proposed long-term actions include construction of off-channel ponds, development of recycled water as an irrigation supply, and conversion to wind machines where applicable. The off-channel ponds that have been designed and implemented at

great expense and effort to those involved are an impressive improvement. Obtaining the necessary permits for water storage, in at least one instance, has also been accomplished. In addition to the seven ponds already being developed, additional pond development is proposed for the coming years in order to further expand capacity and reduce demand for direct diversions. Funding is available for these projects on a cost-share basis to eligible parties. We recognize the extraordinary achievement of putting this infrastructure in place prior to the 2010 frost season, which will allow significant reductions in demand for direct diversions during frost events.

The actual reduction of impacts that result from use of the ponds has yet to be determined. The demand offset presented in URSA (2009) assumes a one-time instantaneous demand of 83 cfs with ample time to refill ponds (at a rate to avoid effects) in preparation for the next frost event. However, it is not clear from the proposal how a series of demand events over consecutive nights, such as those observed in 2008, will be managed and what the impacts will be if ponds need to be rapidly refilled in anticipation of successive frost events. In such a scenario, refilling of reservoirs would likely need to be staggered to avoid a rapid drawdown, and this would necessitate some level of watershed coordination.

The use of recycled wastewater for frost protection irrigation is also proposed as a conservation action. The potential exists to use up to 4,000 acre-feet (af) of water a year as an alternative to instream demands. This approach to meeting frost irrigation demands is promising, and we encourage URSA to continue pursuing its implementation. However, several obstacles to its implementation remain. First, lack of funding and a distribution infrastructure, which may be addressed eventually, are not currently resolved. Also, some environmental and regulatory concerns regarding the application and runoff of wastewater have been raised, but they are not addressed in the proposal. These issues will need to be addressed, for this aspect of the proposal to become a tangible conservation action.

BMPs are defined entirely by the standards within or to be integrated into, the Fish Friendly Farming Program, which are similar to those developed in the FPTF. The principle elements of this program include a review of participant's water rights, and an upgraded water use inventory calculator that assesses water demand, both with and without conservation recommendations, and provides criteria for recommending development of off-channel storage if demand exceeds a certain amount. However, specific actions to reduce water demand are not presented in URSA (2009), and the BMPs are not scheduled to be implemented until 2012; this delay in implementation is unfortunate. Based on these considerations, the BMP proposal does not provide us with adequate assurance that water conservation/demand will be sufficient to avoid potential effects on salmonids in the interim period.

Water Budgeting

The RRFCD already maintains estimates of supply and demand for the upper mainstem of the Russian River, and this data is used to manage releases from Coyote Valley dam. URSA does not propose to develop preliminary water budgets for tributaries in Mendocino County. Although an estimate of water demand on an individual, FFF

participant would be included in the BMPs to be implemented in 2012, it does not appear that this information would be used to account for cumulative demand, and incomplete participation would prevent such an analysis. Preliminary water budgets for tributaries would allow URSA to identify those streams in which to focus monitoring and conservation actions.

Oversight/Participation

URSA is described as a governance structure comprised of the following organizations: the Mendocino County Farm Bureau, the Mendocino County Russian River Flood Control and Water Conservation Improvement District (RRFCD), the California Land Stewardship Institute, Mendocino Wine and Grape Commission, the UC Cooperative Extension, the Redwood Valley County Water District, and Mendocino County. The purpose of URSA is to provide a means for participating parties to communicate and make decisions related to the implementation of conservation measures. These activities include outreach and education to landowners, administration of grant funded actions, implementation of the compensatory release program, facilitation of BMP implementation, and the organization of the Science Advisory Group for the purposes of defining and implementing research and monitoring activities. The first three organizations listed above have signed a memorandum of understanding defining their respective roles in URSA.

In our criteria (Attachment A), we describe oversight as a designated body (i.e. an organization such as URSA) empowered to ensure its constituents follow established unified processes and policies in order to implement conservation actions effectively. URSA has succeeded in establishing oversight in two important ways. First, they have leveraged the authority and influence of existing organizations by formally committing them to the responsibility of addressing frost protection issues. Second, they have established procedures for coordinating mainstem diversions during frost events and for designing and implementing other conservation actions.

However, the level of landowner participation and the mechanisms for ensuring compliance with the program have not been stated. In addition, it is not clear to what extent participating organizations, beyond those that signed the MOU, are participating or what their expected roles are. For example, Mendocino County has broad governing authority over land uses via ordinances, etc., yet there is no description of how those authorities might be used to address the frost irrigation issue. And finally, the scope of the governing body appears limited to the mainstem Russian River in Mendocino County. A map indicating the size and location of participating vineyards would help illustrate the effectiveness of the program by indicating the proportion of land being affected and its location relative to salmonid resources.

Effectiveness Monitoring

The principle variable of interest for frost protection is streamflow; in particular, the rate and magnitude of stage changes below a critical flow threshold. The Upper Russian River mainstem is already gaged by USGS gages that provide real time flow information. An additional USGS gage was installed near Talmage Road to provide more complete

streamflow data. In addition to streamflow monitoring, the RRFCD also monitors water use, and by 2010, RRFCD customers will receive upgraded telemetric water meters that will transmit real-time data to inform water releases from Coyote Valley Dam. Real-time monitoring of both streamflow and water demand should substantially improve water management in the Upper Russian River mainstem.

As noted in the URSA proposal, changes in streamflow can be precipitated by multiple variables and may not therefore be a response to management actions. Based on this reasoning, URSA has proposed to investigate the full suite of factors affecting surface flows in two unimpaired tributaries rather than to actually monitor the influence of frost protection activities on surface flows in tributaries. URSA proposes to conduct a comprehensive water budget analysis on two tributaries, Morrison Creek and one other unspecified stream. This study will include the development of a hydrodynamic model used to formulate hypotheses to explain observed flows. Flow gages will be placed in the upper, middle, lower, and confluence reaches of each tributary and the timing of flow initiation, duration of flow, volume, depth, and velocity will be recorded. In addition, nearby groundwater will also be measured to determine the loss or gain of surface flows from interaction with groundwater. Topographic surveys of alluvium and channel form will also be conducted. Results of this study are scheduled for release by 2012. Once the flow modeling of these tributaries is complete, tributaries with potential impacts from frost irrigation activities will be monitored. Results of the water budget analysis will be used to interpret the observed flows in these other streams.

The proposed tributary monitoring program is a significant divergence from the approach envisioned by NMFS, and we have recommended to URSA that they focus on tributaries with significant vineyard development. The purpose of effectiveness monitoring is to determine whether frost water diversions in the tributaries are or are not affecting habitat conditions and to empirically evaluate the success of management actions. The proposed plan fails to address this point, at least until 2012, in favor of conducting research into the factors contributing to the baseline flow condition. This is not immediately useful in detecting the effects of stream diversions during frost protection episodes and unnecessarily delays the establishment of a monitoring feedback loop to be used to inform management actions.

While interesting and potentially informative as a scientific investigation, the development of a complete hydrodynamic model of an unimpaired stream is not needed to isolate the effects of direct diversions on streams during frost events. The typical hydrologic signature of a frost diversion impact is a pronounced stage (or flow) recession corresponding with temperatures below or near freezing, which lasts for only several hours and then returns (or nearly so) to its previous baseline condition. Flow and stage outside this discrete episode reflect the net result of all hydrologic inputs and losses at that point. Therefore, if no variables change during that short period before or after an episode, then those conditions can be used as a baseline reference condition that effectively incorporates the influences of the longer time-scale water budget. Additionally, if diversions are the only variable that changes within that short period of time, and the flow recession is coincident with a frost event, then it is reasonable to infer

that the observed effect is the result of the diversion. Conversely, if no effect is observed, one can conclude the conservation actions were successful in avoiding impacts.

Transparency

URSA proposes to address issues of transparency primarily with the formation of a Science Advisory Group (SAG). This group will be comprised of scientists from multiple relevant disciplines from private consulting firms and universities. Neither resource agency personnel nor vineyard landowners will be involved in this group. The purpose of SAG will be to review monitoring and project proposals in order to ensure the successful implementation of these projects. Reports generated by, and findings of the SAG will be provided to the Frost Protection Task Force.

The SAG appears to be an effort to create an unbiased analysis group, and the inclusion of university faculty and researchers provides credibility to this effort; however, we question whether private consultants hired by the vineyard industry provide such an unbiased entity. The creation of a committee exclusive of government representatives creates an institutional barrier to disclosure that conceals the inner workings from outside parties and has the nearly unlimited ability to filter information. Our request for transparency is based on the legitimate need to know that management decisions related to frost protection irrigation practices are adequately protective of federally threatened steelhead. Without the ability to verify this in a timely manner with access to unfiltered data, we cannot be confident that these voluntary efforts can avoid take of salmonids.

Review of Frost Protection Plan for the Middle Russian River

The Middle Russian River plan focuses on frost protection impacts on tributaries in Sonoma County. Overall, the Sonoma County plan addresses the criteria set forth by NMFS in a general sense, yet the details of how the plan would be implemented are insufficient to determine how effective and extensive this plan would be in practice.

Conservation actions

The conservation goals of the Sonoma plan are to reduce the acute effects on streamflow from frost protection by 1) reducing water demand through best management practices and 2) changing the manner of diversion. While these goals are sound, from the perspective of the Endangered Species Act, the goal is to ensure that frost protection does not result in the "take" of threatened or endangered salmonids. Monitoring streamflow and groundwater and accounting for water use are critical to ensuring the effectiveness of conservation actions.

<u>Short-term actions</u>

The plan includes outreach and technical guidance on conservation actions through the Governing Board. These activities are useful and important to engage landowners in water conservation and monitoring programs.

Under the plan, each participating property will have a best management practices (BMP) plan in place by 2010. Although not stated in the plan, we assume that the plan would

draw from the suite of short-term water conservation BMPs developed in the Frost Protection Taskforce. Multiple organizations would potentially be available for BMP certification to maximize participation. We commend the aggressive time plan to implement BMPs prior to the 2010 frost protection season. However, the extent of BMPs to be implemented is not clear in the plan because it does not provide a clear standard for short term water conservation. Since maintaining adequate streamflows for salmonids is the underlying concern for this process, the implementation of water conservation BMPs should be guided by the water budget in a given stream. Without clear and rational objectives for water conservation, we are not confident that short term actions will be sufficient to limit impacts of frost protection on salmonids.

Long-term actions

The plan provides a brief outline of long-term actions. These components include: identifying actions, identifying funding for these actions, implementing and monitoring the actions, and developing tributary diversion schedules if warranted. These steps are all reasonable; however, the cursory nature of the plan suggests that little progress has been made to date in beginning to pursue these long term solutions. Given the substantial coordination, permitting, and investment needed to implement long-term solutions and the minimal documented progress to date in pursuing these approaches, it remains uncertain whether and to what extent these long-term actions would be realized under the proposed governance structure.

Just like water conservation BMPs, the implementation of long-term conservation actions should be informed by monitoring results to ensure that they are implemented in the appropriate place and that the effects on streamflow will be significant. The plan does not draw a connection between monitoring results and conservation actions.

Water Budgeting

The Tributary Frost Protection Assessment plan offers a practical approach to quantifying water demand by identifying the total area of vineyards using water for frost protection, the source of that water, and the maximum instantaneous demand for a tributary. We commend this approach to developing a full water use accounting program, and we are encouraged to hear that these analyses are already underway. The reduction in demand from short-term conservation actions and potential long-term conservation strategies will also be considered in the assessment. The plan suggests that conservation and monitoring efforts will focus on three main watersheds based on the rationale that these watersheds are most heavily developed with vineyards. While this monitoring plan provides an excellent approach to identifying water demand, the focus on three large watersheds does not address streamflow monitoring at the scale of the threat.

Although water demand will be quantified under the plan, streamflow is not considered in the assessment or in the corresponding evaluation and implementation of appropriate short-term and long-term conservation actions. This is a critical omission because the effects of frost water usage on salmonid habitat will be relative to the size of the stream and unimpaired streamflow (*i.e.*, flows immediately preceding frost protection). Salmonid habitat in smaller streams with naturally low streamflow may be severely

impacted by less extensive vineyard development. NMFS has observed streamflow impairment and the potential for impairment caused by frost protection in small watersheds with limited vineyard development. An initial Tributary Frost Protection Assessment should consider both water supply and water demand to guide monitoring and conservation actions.

Oversight/Participation

Representatives from each of the major vineyard growing valleys within the Russian River watershed in Sonoma County would comprise the governing board. The governing board would become a subcommittee of either the Sonoma County Farm Bureau or the Russian River Property Owners Association. The proposed governing board is reasonable in concept, but since the board is not yet formed, it is not clear how the board would function in practice.

The plan describes support and expected participation from approximately 9600 acres of vineyard (approximately 20% of vineyard acres in the region), primarily comprised of large vineyard holdings. The goal of 100% participation is commendable; however, full participation in a voluntary program is unlikely and it is not clear what level of participation might reasonably be expected. The plan does not propose a means to address non-participants. A regulatory backdrop may be needed to address diverters who will not participate in a voluntary program.

Effectiveness monitoring

The plan proposes limited streamflow monitoring in large tributaries that are highly developed with vineyards. The proposed monitoring plan is intended to consider 1) the effects of water diversions on stream flow and salmonid habitat, 2) the effects of other factors on streamflow, and 3) whether conservation actions are effective at addressing effects on streamflow. The plan proposes to monitor three highly developed tributaries and two streams with unimpaired streamflow to assess natural processes affecting streamflow.

NMFS supports streamflow monitoring in the three watersheds identified in the plan (Mark West, Maacama, and Green Valley); however, additional monitoring is needed in the smaller tributaries with diversions for frost protection. Additionally, assessments of the relationship between salmonid habitat requirements and streamflow should be conducted to establish reach specific minimum flow guidelines for diversions. The lack of streamflow monitoring and salmonid habitat flow requirements was documented as a barrier to accurately assessing water availability by the SWRCB twelve years ago (SWRCB 1997). The Frost Protection Plan for the Middle Russian River provides streamflow monitoring in some key watersheds, but does not address streamflow and salmonid needs at the spatial scale necessary to ensure effective management of streamflow for threatened and endangered salmonids.

The plan's proposal to monitor unimpaired tributaries, while interesting and informative, does not answer questions critical to guiding frost protection conservation actions. NMFS recognizes that natural processes may affect streamflow, however, as Deitch

(2006) concluded after observing significant drops in streamflow in the Maacama and Franz creek drainages, "these natural catchment processes cannot explain the sudden changes in stream flow in spring that occur only on days when temperatures are near freezing, especially considering that no such changes occur in streams without upstream vineyard development" (Deitch 2006). If monitoring resources are limited, initial streamflow monitoring should focus on impaired streams to provide the information needed to take immediate and meaningful actions to address streamflow impairment caused by frost protection.

Transparency

Similar to the URSA plan, the Sonoma plan proposes to address transparency through reporting and a Science Advisory Group (SAG). Monitoring data will be reviewed by the SAG, and only released once the governing board and the SAG are confident in the accuracy and reliability of the data. Participants will be identified to the agencies and each participant will submit a detailed water use report. The governing board will communicate with the SWRCB on an *ad hoc* basis as issues arise, and a year end summary report will be shared with agencies.

The SAG process is similar to the URSA plan, except that the governing board will approve monitoring data before reports are released. We are again concerned that the exclusion of agency staff from the SAG process will not achieve the goal of transparency, and that the release of information will be filtered by the governing board.

In addition to *ad hoc* communication, regularly scheduled communication should occur between the governing board, fisheries resource agencies, and the SWRCB to identify and address issues in a timely manner and ensure that the plan is effective. During the frost protection season (March-May), regular reporting on stream flows and water use to agency staff should occur through meetings or written communication. A year end summary report is not sufficient to identify and address frost protection impacts.

Overall, the limited spatial scope of streamflow monitoring on tributaries and the exclusion of agency staff from the timely review and discussion of monitoring results does not achieve a standard of reasonable disclosure and open decision making. In recent meetings of the Frost Protection Taskforce, agency staff has encouraged stakeholders and their representatives to develop a system of self-governance with collaborative agency involvement. Such cooperative agency involvement is not reflected in this plan.

Review of Russian River Property Owners Association Plan

The Russian River Property Owners Association (RRPOA) plan addresses frost protection and monitoring activities in the Alexander Valley reach of the Russian River in Sonoma County. It is our understanding that the RRPOA participants use wells for frost protection rather than surface flow diversions. The RRPOA proposal lays out a plan for assessing the effects of well withdrawals for frost protection on groundwater and streamflow in the Russian River and nearby tributaries.

Conservation actions

Short-term actions

RRPOA plan participants will implement appropriate BMP practices from the list of water conservation practices developed through the FPTF. BMP implementation will be determined on a site specific basis and may vary depending on water year conditions. The plan does not provide a clear standard for short term water conservation; however, the process of adaptive management based on monitoring results is emphasized throughout the document. This approach seems reasonable, particularly since the effects of groundwater withdrawals on streamflow are not well understood to date.

The Sonoma County Winegrape Commission will conduct outreach and education on water conservation practices, as well as targeted education for priority frost areas or lower performing vineyards. Additionally, the RRPOA will work with the Sonoma County Winegrape Commission to develop a program for self-reporting of water conservation BMP practices. The proposal does not include a verification component to the self-reporting program; however, water use data could likely be used to verify the implementation of water conservation practices. The timeline for developing such a self-reporting program is not stated.

Long-term actions

RRPOA will develop plans for offstream storage sites beginning in 2010, and these plans will be guided by initial water analysis and water use data. No significant progress toward developing long-term alternatives has been identified to date; however, NMFS is encouraged by the proposed use of monitoring data to guide the implementation of long term solutions.

Water Budgeting

The RRPOA plan alludes to a preliminary analysis that will identify the hydrologic benefits of BMP implementation and the cumulative benefits of participants along a stream. It is unclear whether a preliminary estimate of water use would be realistic given incomplete participation in the program. The plan refers to a "drainage water analysis," but it is unclear whether an estimate of streamflow would be included in this preliminary analysis.

Oversight/Participation

Although not explicitly stated, it is our understanding that the RRPOA represents a relatively limited contingent of vineyards within the Alexander Valley. A localized approach may be appropriate for the Alexander Valley, given that vineyards there primarily rely on the use of wells drawing on a broad aquifer rather than surface water diversions. However, participation within the localized area is not complete, causing us to conclude that a regulatory backdrop may be needed to reach full participation in conservation and monitoring efforts.

Effectiveness monitoring

The RRPOA has been working with the Center for Ecosystem Management and Restoration (CEMAR) for the past year to monitor groundwater levels and streamflow in

the Alexander Valley reach of the mainstem Russian River. This proactive, voluntary monitoring approach is commendable.

Beginning in 2010, the RRPOA will install four additional telemetric streamflow gages, two in the mainstem and two in the lower portions of two tributaries. The RRPOA will apply for grant funding to expand tributary monitoring activities. Additionally, two grids of piezometers will be installed, one adjacent to the mainstem and one adjacent to a tributary. We understand that combined with streamflow data, these piezometers, will provide information on the interactions between groundwater levels and streamflow. Altogether, data from streamflow gages, piezometers, wells, and water use should provide the information necessary to more accurately determine the effect of groundwater pumping on streamflows in the Alexander Valley reach. The RRPOA plan will also use gage data to establish flow thresholds for salmonid needs and create water management plans accordingly. This step is particularly valuable, and has not been proposed in other plans.

In addition to monitoring data, the RRPOA has offered to conduct field assessments with NMFS staff during periods of frost protection or other irrigation activities, as well as outside of those periods to document naturally occurring dewatering events.

The RRPOA has developed a comprehensive approach to monitoring the effects of well withdrawals for frost protection on streamflow in the Russian River mainstem and selected tributaries. As discussed above, the RRPOA represents a limited number of vineyard interests, and given that, it has accomplished significant monitoring coverage of the Alexander Valley. Ultimately, broader participation and monitoring is needed to ensure that frost protection impacts from all users are monitored and addressed.

Transparency

The RRPOA plan appears to achieve a standard of transparency that will allow NMFS to work collaboratively with landowners to assess the effects of frost protection and develop solutions to issues that arise. The RRPOA plan emphasizes agency involvement in the monitoring and assessment process, which is not seen in the other proposals. Agency staff is included in the placement of gages on the mainstem Russian River. Agency staff will participate in stream surveys during frost and other streamflow events. Since the RRPOA will be using SWRCB telemetric gages, agency staff will have access to real time gage data. Similar to the other two proposals, monitoring data will be compiled into a report to be submitted to the resource agencies; however, rather than an annual report, the proposal indicates that reports will likely be submitted on biweekly basis during the frost season. Overall, this proposal seems to encourage collaboration and open data sharing with agency staff in plan implementation, monitoring and adaptive management.

Summary of Frost Protection Reviews

Efforts to develop conservation tools and monitoring plans as a part of the FPTF have been fruitful. Progress can be seen in the $5.7 million in grant funds to develop and improve agricultural water infrastructure, the construction of offstream storage ponds, improved coordination of compensatory dam releases, plans to report water use,

improved frost forecasting abilities, local monitoring programs, and a general increased awareness of the effects of frost protection on streamflow. Despite substantial progress, diversions for frost protection continue to present a widespread risk to threatened and endangered salmonids.

Overall, greater progress has been made in addressing frost protection risks in the Russian River mainstem then in its tributaries. Several factors differentiate management needs in the mainstem and in tributaries to the Russian River watershed. The mainstem Russian River already has multiple gages managed by the USGS. In Mendocino County, the RRFCD also monitors water use and coordinates with vineyards that divert water from the mainstem. The Upper Russian River Sustainability Alliance has made substantial progress in pursuing long-term conservation actions for the mainstem and developing a system of self-governance. In the Alexander Valley reach of the Russian River mainstem, wells are used for frost protection rather than diversion of surface water. This is possible because the Alexander Valley sits on top of a large aquifer. The precise extent to which groundwater withdrawals affect surface flow in this reach has not yet been established, however, the existing and proposed monitoring program in this reach makes substantial strides in addressing this question.

In comparison to the mainstem, little progress has been made to address the threat of frost protection in tributaries in either county. Tributaries present a challenge to management because of a lack of instream flow data, limited availability of water-use information, and the number of subwatersheds with different water regimes. A lack of data on streamflow and related salmonid flow requirements in tributaries to the Russian River has hindered effective water management for over a decade (SWRCB 1997). Yet through research (Deitch 2006) and several reliable reports to fisheries resource agencies and observations by resource agency staff, we know that frost protection has caused major reductions in streamflow that pose significant threats to threatened salmonid populations. Yet none of the plans include a monitoring component that is sufficient to overcome data gaps on a spatial scale consistent with the full area in which impacts are likely. The RRPOA plan is the only proposal that relates water management plans or conservation goals to salmonid habitat requirements via the incorporation of instream flow data. Further action is needed to ensure that this information is collected and used to promote effective resource management that is comprehensive and transparent.

The continued expansion of vineyards into progressively more frost prone area perpetuates streamflow impacts. None of the proposals attempt to address the issue of planning for the frost protection demand of future vineyard development. Each plan is geared toward options that promote the continued use of irrigation as a means to protect vines from frost. This ongoing dependence on water combined with continued vineyard expansion is likely to increase demand and pose even greater challenges to providing water in an environmentally appropriate manner. Any long-term management plan intended to address the effects of water use on salmonids should address these larger scale issues. In lieu of voluntary planning efforts, the SWRCB should clarify to the Counties' planning and permitting divisions that development creating additional demands on the water system should not be approved at any level until the SWRCB can

ensure that water is available. If water availability is not considered in land use permitting, illegal water diversions will likely continue to proliferate, undermining management objectives.

Each of the proposals rely on voluntary participation; however, voluntary participation alone is not sufficient to ensure all frost irrigators will actively reduce their impacts. Given the scope and potential severity of threats posed by frost protection, a more universally applicable incentive mechanism is needed. Additionally, while a unified governance proposal is not necessarily essential to effective oversight, employing three independent approaches creates the potential for inconsistencies. A larger governance structure, such as that provided by the SWRCB, would provide consistent standards throughout the basin.

Recommendations to the SWRCB

The Endangered Species Act prohibits the "take" of threatened or endangered species. The SWRCB has the authority and responsibility to weigh the effects of water use on public trust resources, particularly for threatened and endangered species, and manage such use accordingly. Frost protection poses a documented, ongoing, and widespread threat to threatened and endangered salmonids in the Russian River watershed. Viable alternatives to standard direct diversion methods and uses do exist. While the FPTF has made substantial progress, the proposed voluntary programs do not provide a comprehensive method to avoid "take" of listed salmonids. We therefore conclude that the direct diversion and use of water for frost protection without regard for streamflow is unreasonable and that the SWRCB exercise its vested authority to regulate agricultural water diversions during the frost season to avoid continued "take" of threatened and endangered salmonids.

NMFS maintains that the criteria established to evaluate effective frost protection outcomes should be addressed in any regulation developed by the SWRCB. We suggest a water allocation system to ensure adequate flows for salmonids while providing for water users' needs. Several elements will be required to make this system work effectively: 1) a full accounting of water availability based on comprehensive streamflow monitoring and reporting of water use, 2) a standardized method for establishing instream flows that protect salmonids during periods of frost protection, and 3) a means to apply and enforce instream flow criteria across the basin. We recommend that the application and enforcement of flow criteria be implemented at a local or regional level. A state appointed water master could provide this level of oversight. We support a regulation that builds on progress to date and allows stakeholders an opportunity to voluntarily address their impacts if they can demonstrate a level of commitment commensurate with the NMFS criteria. A regulatory backdrop, however, is an essential component of the solution because it is the best way to ensure comprehensive monitoring and full participation in conservation efforts to avoid streamflow impairment.

Although the FPTF has made substantial progress in developing strategies to address the effects of frost protection on streamflow, further actions are needed to avoid further

taking of salmonids. NMFS respectfully requests that the SWRCB exercise its authority to manage water use based on the existing threats to public resources and threatened and endangered salmonids.

References

Deitch, M.J. 2006. Scientific and Institutional Complexities of Managing Surface Water for Beneficial Human and Ecosystem Uses under a Seasonally Variable Flow Regime in Mediterranean-Climate Northern California. Dissertation. University of California, Berkeley. 308 pp.

Russian River Property Owners Association (RRPOA). 2009. Frost protection best practices program, Sonoma County. Submitted to NMFS via electronic mail on October 30, 2009.

Sonoma County Frost Protection Resources Protection Group (RPG). 2009. Frost Protection Plan for the Middle Russian River. Submitted to NMFS via electronic mail on September 21, 2009.

State Water Resources Control Board (SWRCB) Division of Water Rights. 1997. Staff report Russian River Watershed: Proposed Actions to be taken by the Division of Water Rights on Pending Water Right Applications within the Russian River Watershed. 40 pp.

Upper Russian River Stewardship Alliance (URSA). 2009. Water Management and Conservation for Frost Control in the Upper Russian River, Mendocino County. Submitted to NMFS via electronic mail on September 16, 2009.

Attachment A:

NMFS Standards for Success. Provisional criteria for evaluating the success of Frost Protection Task Force efforts

Enclosure B

DRAFT
Frost Protection Threat Assessment for Threatened and Endangered Salmonids in the Russian River Watershed

Prepared for the State Water Resources Control Board Public Workshop on Frost Protection, November 18, 2009

National Marine Fisheries Service
777 Sonoma Avenue
Santa Rosa, California

November 10, 2009

The use of water for protection of grape vines from frost poses a documented threat to federally threatened and endangered salmonids in the Russian River watershed. In this report, we assess the spatial and temporal scope of that threat based on the physical setting, frost protection practices, salmonid ecology, documented strandings in the Russian River watershed, and literature describing the factors that contribute to salmonid strandings. Based on our evaluation, we conclude that the threat of frost protection on salmonids is significant and widespread throughout the Russian River watershed.

Hydrologic Impacts

Aerial application of water via overhead sprinklers is widely used in vineyards as the preferred method to protect new growth on vines from damage associated with spring frost events. Recent research by Deitch *et al.* (2008a) indicates acute hydrologic impacts in streams resulting from this practice. Their study of the Maacama Creek watershed, tributary to the Russian River, showed abrupt reductions in stream flow of up to 97% on cold spring mornings when the air temperatures approached freezing. These hydrologic deviations lasted from hours to days, and then flow returned to near previous levels as the demand for water subsided. Streams with no upstream vineyards showed no such changes in flow. Deitch *et al.* (2008a) also documented pronounced cumulative effects downstream of vineyards, with springtime flow temporarily diminishing to approximately zero for a 36km^2 tributary with 16% of its drainage area covered in vineyard. Additionally, researchers concluded that natural catchment processes were not sufficient to explain the observed flow changes; rather, they were due to small instream diversions associated with frost protection irrigation of vineyards (Deitch *et al.* 2008a).

Precipitation is strongly seasonal in the region, which results in naturally low stream flows in Russian River tributaries during spring and summer. Merenlender et al. (2008) estimates demand for water via surface diversions during this period to potentially exceed the total flow in many parts of the Russian River. Though this estimate does not include water for frost and is not specific to vineyard uses, it is indicative of high demand for water resources and high potential for hydrologic impacts. A similar study that does not account for simoultaneous demand for frost protection diversions, estimates that existing diversions may reduce streamflow during spring by 20% in one-third of Russian River streams investigated (Deitch *et al.* 2008b).

Overhead application of water for frost protection typically consumes 50 gallons per minute per acre of vineyard. Application episodes can persist for several hours and often occur simultaneously across all vineyards exposed to the risk of frost. This can create large instantaneous demands and therefore pose great risk of hydrologic impacts, particularly in small streams with little flow. Deitch et al. (2008a) observed an estimated extraction of 3.7 million gallons of water from Franz Creek during a single frost event. Diversions for frost protection, however, can affect all sizes of streams, as observed in the mainstem Russian River in April 2008. During the four frost events that occurred in rapid succession, an estimated 411 acre-feet were drawn from the river to meet frost protection needs, with the maximum instantaneous demand of approximately 83 cfs.

Biological Response to Stream flow Recessions

Vineyard frost protection generally occurs between March and May, and this corresponds with several life history stages for salmonids. Steelhead and coho salmon embryos develop and hatch from redds during this period, and tiny alevin reside within the interstitial spaces of gravel. Whereas embryos can remain viable for weeks in dewatered gravel, alevin will not survive if gravels are dewatered (Hunter 1992). Once coho salmon emerge from the gravel, the fry occupy shallow water along stream margins, side channels, or other low velocity habitats where they feed and rear (Sandercock 2003, Shapovalov and Taft 1954). Steelhead fry also occupy shallow stream habitats, including riffles and other areas that provide increased foraging opportunities (Barnhart 1986, Olson and Metzgar 1987). These small fry are most susceptible to stranding because they have limited swimming abilities (Hunter 1992). Also coincident with the timing of frost protection in the spring, coho salmon and steelhead smolts, which have spent one to two years rearing in tributaries, migrate from tributaries, into the Russian River, and out to the ocean. Smolts tend to have stronger swimming abilities than the smaller fry, but they are still susceptible to rapidly declining stream flows that may leave them stranded.

Juvenile salmonids may become stranded when side channels, backwater areas, or potholes become disconnected from the mainstem, when gravel bars dry up, or in extreme dewatering events when pools go dry (Bradford 1997, Hunter 1992). The greatest potential for stranding occurs in low gradient areas because the rate of surface water retreat is greatest per increment of stage change (Bell *et al.* 2008, Hunter 1992, Monk 1989). Strandings tend to occur more frequently over large cobble substrate (Bell *et al.* 2008, Monk 1989), presumably because salmonid fry tend to hold their position over large cobbles or in the interstitial spaces between cobbles rather than moving downslope with receding waters (Monk 1989).

The incidence of stranding is influenced by time of day, the magnitude of flows, the rate of stage change, season, species, life stage, channel contour, and substrate type (Bradford *et al.* 1997, Hunter 1992). Stranding increases dramatically when flow drops below a certain water level, defined as the critical flow (Hunter 1992). This corresponds to the flow below which the low gradient gravel areas that fish utilize become exposed. Other considerations for stage change events include the season and time of day that the event occurs. Several studies have found that stranding occurrence is correlated with the time of day; however, the results are dependent on salmonid species (Bradford 1997, Monk 1989). Coho salmon are more likely to be stranded at night (Bradford 1997), whereas, strandings of juvenile Chinook salmon may be more likely during daylight hours (Bradford 1997, Monk 1989). The stranding of steelhead fry does not seem to be correlated with daylight (Monk 1989). Finally, salmonids are more likely to be stranded from flow reductions when water temperatures are closer to freezing (Bradford 1997, Halleraker *et al.* 2003, Saltveit *et al.* 2001). This means that stream flow reductions are more likely to result in strandings on cold mornings when frost protection would be employed.

Spatial Extent of Frost Protection Impacts

In light of the evidence of hydrologic impacts associated with vineyard development (Deitch *et al.* 2008a), extensive vineyard development in the basin, suggests the impacts of frost protection on salmonids are likely widespread, extending beyond those documented to date. Vineyard agriculture has rapidly expanded in the Russian River watershed and, as of 2006, covers over 60,000 acres of land (Heaton 2008). The proportion of vineyards in the watershed using water for frost protection and their diversion methods are presently unknown. However, in Mendocino County, a study based on grower surveys, production manuals, and professional judgment estimated that approximately 5,623 acres out of 15,539 vineyard acres employ frost protection irrigation (Lewis *et al.* 2008).

Salmonid strandings have been documented to occur in diverse areas of the watershed. Stranding mortalities were associated with the use of frost protection in the upper mainstem in 2008 and an enforcement case is underway for strandings in Felta Creek, a small tributary in Sonoma County, occurring in 2008 and 2009. Additionally, a study conducted in 2004 and 2005 found that diversions for frost protection reduced flows by 50-100% in two larger tributaries to the Russian River (Deitch 2006). Deitch (2008b) analyzed appropriative water rights in the watershed and concluded that flow reductions of over 20% are likely in one third of Russian River tributaries. This study did not consider the effects of unpermitted diversions. Based on this information, we conclude that diversions for frost protection pose a considerable and widespread threat to salmonids in the Russian River and its tributaries.

Given the documented hydrologic impacts, their consistent association with vineyards in studied streams, and the observed salmonid mortalities elsewhere, it is reasonable to assume the risk of stranding is present wherever vineyards are adjacent to streams occupied by salmonids. However, particular circumstances, such as a low risk of frost event, or an alternative method of frost protection, may reduce or eliminate this risk.

Frequency of Frost Protection Impacts

The Berkeley Water Center analysis of the stream flow measured at the USGS Hopland gage and temperature data from Ukiah (National Weather Service) indicates that since 1989, frost events occurred in 75% of years, and that in one-third of years, temperatures dropped below 35F at Ukiah on five or more nights in the spring (Hunt 2009). Data suggesting a greater frequency was presented in Deitch et al. (2008a). In Maacama Creek, they observed a frequency of six and seven frost events in 2004 and 2005, respectively (Deitch *et al.* 2008a). Also, the number of days in which frost protection drawdown events were observed at Hopland regularly exceeded the number of days in which temperatures indicate that frost protection would be required, and the difference between those numbers has increased over time (R^2= 0.601). This increasing trend may be caused by vineyard expansion into increasingly frost prone land where temperatures are lower than at the Ukiah weather station, or by an increasingly risk-averse approach to protecting vines from frost. Based on the historical occurrence of freezing temperatures

in the spring and an increasing trend toward employing frost protection practices, frost protection impacts are likely to be a concern nearly every spring.

The Russian River is characterized by extreme variability in both seasonal and annual precipitation and streamflow (Lewis et al. 2000). Although frost protection via direct diversion will affect stream flow in most years, frost protection drawdowns are most pronounced after dry years. Also, since flows tend to be lower, stream flow recessions are more likely to impact salmonids after a dry year. The spring of 2008 was a particularly concerning season for frost protection impacts, because several successive frost events occurred following a drier than usual winter. Salmonid stranding mortalities were observed in the mainstem Russian River and in Felta Creek in 2008, and again in 2009. Although frost protection impacts are not limited to dry years, the threat to salmonids is greatest following dry winters, particularly in unregulated tributaries. Climate change is expected to result in reduced average runoff and increased frequency and severity of both floods and droughts (IPCC 2005); therefore, plans for water management with future dry year conditions in mind would be prudent.

Population Effects

In this section, we describe the probable effect of the threat from frost protection on the survival and recovery of salmonids in the Russian River, given the status of each species. Our agency recently undertook a thorough analysis of the status of each of the three species in the Russian River as part of a Federal Endangered Species Act (ESA) consultation (NMFS 2007), and is currently developing recovery plans for each (NMFS 2009). For brevity, we refer only briefly to species status and encourage the reader to refer to these other documents for a more thorough treatment of the subject.

Central California Coast coho salmon are listed as Endangered under the ESA. The Russian River population historically supported the largest population in the Evolutionarily Significant Unit (ESU). This implies it played a central role in maintaining the viability of the ESU. This population is nearly extirpated from the watershed and persists largely due to the efforts of the captive broodstock program, which raises juveniles in a hatchery and releases them into various streams. Remaining habitat for this species is fragmented, generally of poor quality, and is limited to tributaries in the lower basin. The draft recovery plan identifies agricultural practices and water diversions as two of the highest-ranking threats to this population.

Central California Coast steelhead are listed as Threatened under the ESA. Though their abundance is significantly reduced from historical levels, they continue to spawn and rear in most of the basin's tributaries, and to a limited extent in the mainstem. Unlike coho salmon, several separate populations occupy the Russian River. These populations represent the northern most extent of the Distinct Population Segment (DPS[1]). Their survival and recovery are therefore important in maintaining the species spatial structure as well as its overall abundance and diversity.

[1] A DPS is analogous to an ESU.

California Coastal Chinook salmon are also listed as Threatened under the ESA. Unlike steelhead, the Russian River represents the southern most population for this ESU. And, unlike both of the other species, Chinook salmon rely more heavily on mainstem habitats to complete the freshwater portions of their life-cycle. They have maintained a persistent population in recent years and are important to the ESU viability for the same reasons as steelhead.

Vineyard development is concentrated near rivers and streams that salmonids rely on for spawning and rearing. Seventy percent of the total vineyard parcels in the Russian River watershed are within 300 ft of salmonid habitat, and conversely, 25% of all salmonid habitat is within 300 ft of a vineyard[2]. The spatial association between vineyards and salmonid habitat, the high demand for water (Deitch *et al.* 2008b, Merenlender *et al.* 2008), and the known hydrologic consequences (Deitch *et al.* 2008a) pose significant risks to the survival and recovery of these species by interfering with the successful completion of their juvenile rearing and smolt migration life stages across significant portions of their habitat and in most years.

It is important to note that, for all three species, multiple environmental factors control their survival. A common misconception is that declines in anadromous fish populations are caused larger climactic variations such as poor ocean conditions or drought episodes. In recent testimony on this subject, Lindley (2009) made the distinction between proximate and ultimate causes for the decline of anadromous fish populations that helps to dispel this notion. Unfavorable ocean conditions can cause such declines, but are considered to be proximal in that they are responsible for reduced survival of individuals in a population that is already predisposed to extinction due to their reduced viability (i.e. reduced life history diversity which makes a population less resilient to normal environmental variation). This latter factor is the ultimate cause of decline and is attributed to chronic degradation of freshwater habitats. Climate variation drives large increases and decreases in population abundance, while steady degradation of freshwater habitats makes populations more susceptible to this variation.

Addressing the Threat

Although NMFS has identified that the threat from frost protection is significant and widespread, given the spatial extent of the issue, it is not feasible for NMFS enforcement staff to patrol the full extent of salmonid habitat every time that frost protection is employed. A staff report from the State Water Resources Control Board (SWRCB) in 1997 identified the threat posed by frost protection to spring stream flow and salmonid habitat and concluded that new diversions for frost protection represented an unreasonable method of diversion and use of water. The staff report identified the primary barriers to accurately assessing water availability in the Russian River watershed. These barriers were 1) a lack of stream flow gauging data from tributaries, 2) a lack of a comprehensive stream flow needs assessment for salmonids, and 3) incomplete

[2] This result is based on an analysis of vineyard distribution (Heaton 2008) and intrinsic potential habitat for steelhead (Agrawal 2005). Steelhead IP habitat is the most extensive of the three species in the basin and is inclusive of the other two.

information on water use in the watershed. In the time since the staff report was written, total vineyard acreage expanded by nearly 40% in Sonoma County (Sonoma County 1999 and 2008), and total bearing acreage expanded by almost 30% in Mendocino County (Mendocino County 2001 and 2008). Frost protection diversions continue to pose a threat to stream flow and salmonid habitat, salmon populations have continued to decline, and the barriers to effective water management continue to exist today. Action is needed to limit diversions for frost protection and eliminate barriers to effective water management.

The FPTF criteria developed by NMFS in August 2009 focused on addressing the barriers to effective management of stream flow for salmonids during frost protection events. Monitoring and transparency are two key elements to developing accountability for impacts to stream flow and allowing for effective management of threatened and endangered species. Whereas substantial progress in establishing plans for monitoring and transparency has been made in specific areas of the watershed (i.e. Upper Russian River mainstem, Alexander Valley Reach of the mainstem and selected tributaries), the majority of tributaries will remain unmonitored under the proposed voluntary measures. A regulation would ensure that streams are monitored on a scale commensurate with the scope of the impacts and that monitoring results guide water use decisions.

In addition, an effective threat amelioration strategy requires full participation of frost diverters throughout the watershed. None of the proposed oversight organizations have the authority (or willingness) to enforce compliance with their management plans. Regulation is therefore the only mechanism proposed to date that would ensure universal compliance with environmentally appropriate water use management.

References

Agrawal, A., R.S. Schick, E.P. Bjorkstedt, R.G. Szerlong, M.N. Goslin, B.C. Spence, T.H. Williams, K.M. Burnett. 2005. Predicting the potential for historical coho, Chinook and steelhead habitat in Northern California. NOAA Technical Memorandum NMFS, NOAA-TM-NMFS-SWFSC-379.

Barnhart, R.A. 1986. Species profiles: life histories, and environmental requirements of coastal fishes and invertebrates (Pacific Southwest)-- steelhead. U.S. Fish and Wildlife Service Biological Report 82 (11.60). U.S. Army Corps of Engineers, TR EL-82-4. 21 pp.

Bell, E., S. Kramer, D. Zajanc, and J. Aspittle. 2008. Salmonid fry stranding mortality associated with daily water level fluctuations in Trail Bridge Reservoir, Oregon. North American Journal of Fisheries Management 28: 1515-1528.

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

Deitch, M.J. 2006. Scientific and Institutional Complexities of Managing Surface Water for Beneficial Human and Ecosystem Uses under a Seasonally Variable Flow Regime in Mediterranean-Climate Northern California. Dissertation. University of California, Berkeley. 308 pp.

Deitch, M.J., G.M. Kondolf, and A.M. Merenlender. 2008a. Hydrologic impacts of small-scale instream diversions for frost and heat protection in the California wine country. River Research and Applications 25(2): 118-134.

Deitch, M.J., G.M. Kondolf, and A.M. Merenlender. 2008b. Surface water balance to evaluate the hydrological impacts of small instream diversions and application to the Russian River basin, California, USA. Aquatic Conservation: Marine and Freshwater Ecosystems 19(3): 274-284.

Halleraker, J.H., S.J. Saltveit, A. Harby, J.V. Arnekleiv, H.P. Fjeldstad, and B. Kohler. 2003. Factors influencing stranding of wild juvenile brown trout (*Salmo trutta*) during rapid and frequent flow decreases in an artificial stream. River Research and Applications 19: 589-603.

Hunter, M.A. 1992. Hydropower flow fluctuations and salmonids: A review of the biological effects, mechanical causes, and options for mitigation. State of Washington Department of Fisheries. Technical Report 119. 46 pp.

Heaton, E. 2008. GIS vector digital data, 2006. IHRMP North Coast Lab. UC Berkeley, Berkeley, California.

Hunt, J., D. Agarwal. 2009. Draft analysis of USGS Hopland gage data, 1989 to 2009. Provided to the National Marine Fisheries Service via e-mail on March 27, 2009, Santa Rosa, California.

Intergovernmental Panel on Climate Change (IPCC). 2007. Climate Change 2007: Synthesis Report. 73 pp. http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf

Lindley, S.T. 2009. Direct testimony of Steven T. Lindley on behalf of NOAA National Marine Fisheries Service. Written testimony provided before the Federal Energy Regulatory Commission, Office of Administrative Law Judges on the matter of Turlock Irrigation District and Modesto Irrigation District Don Pedro Project. FERC Project Nos. 2299-065 and 2299-053.

Mendocino County Agricultural Crop Report. 2008. http://www.co.mendocino.ca.us/agriculture/cropStats.htm

Mendocino County Agricultural Crop Report. 2001. http://www.co.mendocino.ca.us/agriculture/cropStats.htm

Merenlender, A.M., M.J. Deitch, and S. Feirer. 2008. Decision support tool seeks to aid stream-flow recovery and enhance water security. California Agriculture 62(4): 148-155.

Monk, C.L. 1989. Factors that Influence Stranding of Juvenile Chinook Salmon and Steelhead Trout. Thesis. University of Washington, Seattle, WA. 81 pp.

National Marine Fisheries Service (NMFS). 2007. Biological Opinion for water supply, flood control operations, and channel maintenance conducted by the US Army Corp of Engineers and the Sonoma County Water Agency in the Russian River watershed. National Marine Fisheries Service, Southwest Region, Santa Rosa, California.

NMFS. 2009. Public draft recovery plan for Central California Coast coho salmon (*Oncorhynchus kisutch*) evolutionarily significant unit. National Marine Fisheries Service, Southwest Region, Santa Rosa, California.

Olson, F.W. and Metzgar, R.G. 1987. 'Downramping to minimize stranding of salmonid fry', in Clowes, B.W. (Ed.), Waterpower '87, Proceedings of the International Conference on Hydropower. American Society of Civil Engineers, New York. pp. 691-701.

Salveit, S.J., J.H. Halleraker, J.V. Arnekleiv, and A. Harby. 2001. Field experiments on stranding in juvenile Atlantic salmon (*Salmo salar*) and Brown trout (*Salmo trutta*) during rapid flow decreases caused by hydropeaking. Regulated Rivers: Research and Management 17: 609-622.

Sandercock, F.K. 2003. Life history of coho salmon (*Oncorhynchus kisutch*). Pages 395-446. *In* C. Groot and L. Margolis, editors. Pacific Salmon: Life Histories. UBC Press, Vancouver, BC.

Shapovalov, L. & Taft, A.C. 1954. Fish Bulletin No. 98. The Life Histories of the Steelhead Rainbow Trout (*Salmo gairdneri gairdneri*) and Silver Salmon (*Oncorhynchus kisutch*) with Special Reference to Waddell Creek, California, and Recommendations Regarding Their Management. 375 pp. http://escholarship.org/uc/item/2v45f61k

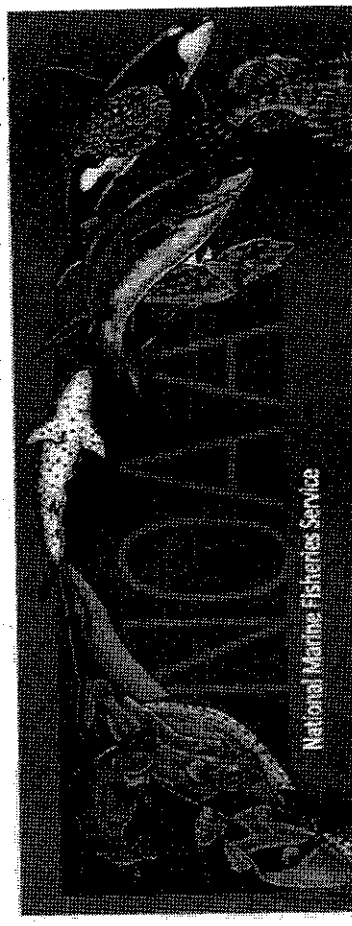
Sonoma County Agricultural Crop Report. 2008. http://www.sonoma-county.org/agcomm/crop_report.htm

Sonoma County Agricultural Crop Report. 1999. http://www.sonoma-county.org/agcomm/crop_report.htm

SWRCB Division of Water Rights. 1997. Staff report Russian River Watershed: Proposed Actions to be taken by the Division of Water Rights on Pending Water Right Applications within the Russian River Watershed. 40 pp.

Enclosure 3

Science, Service, Stewardship



NMFS Standards for Success

Provisional criteria for evaluating the success of Frost Protection Task Force efforts

National Marine Fisheries Service

NOAA

NMFS Responsibilities

- Enforce ESA take prohibitions
- Work with SWRCB to resolve water resource issues
- Support voluntary conservation initiatives

NOAA

By October 10th NMFS Will:

- Document FPTF efforts to date
- Evaluate progress of the FPTF
- Provide our recommendation to the State Water Resources Control Board

Standards for Success

- Conservation Actions
- Effectiveness Monitoring
- Transparency

Conservation Actions

- Direct Actions
  - Short Term
  - Long Term
- Planning
  - Water Budgeting
  - Land Use Planning
- Oversight

Planning: Water Budgets

- Estimate supply and demand at the sub-watershed scale
- Use streamflow and diversion data to improve estimates
- Use results to support conservation strategies

Planning: Land Use

- Limit new water diversions so as not to undermine conservation efforts
- Avoid planting frost sensitive crops in frost prone areas
  - e.g. Frost planning map

Oversight

- Establish accountability
- Secure full participation
- Define and follow a decision protocol for coordinating diversions
- Monitor and report on compliance

Participation

- Having all diverters subject to oversight
- Provide for corrective action in cases where the rules have been ignored or misconstrued

Effectiveness Monitoring

- Streamflow monitoring
  - Coverage sufficient to detect effects
  - Compatible with water budget needs
- Water use monitoring
  - Rate, timing, volume and location

Key Watersheds

- Dry Creek
  - Mill, Felta Creek
  - Grape, Wine, Crane Creek
  - Pena Creek
- Green Valley Creek
  - Purrington, Atascadero Creek
- Mark West Creek
  - Porter Creek
  - Others?
- Maacama Creek
  - Redwood
    - Yellowjacket, Kellog Crees
  - Franz Creek
  - Others
- Tributaries to Mainstem
  - Miller, Grub, Gill, Crocker, Sunset Creek
  - Feliz Creek, Dooley Creek
  - Other Mendocino County streams
- Mainstem

Transparency

The free exchange of information with public agencies signals a willingness to assume responsibility for public trust resources and is a necessary condition to authentic collaboration.

Transparency

- Track and verify actions
- Full disclosure of:
  - Operations and irrigation practices
  - Valid water rights with terms of use
- Independent data management
- Open decision-making processes

Conclusion

- We are looking for:
  - Verifiable actions
  - Effective results
  - Reasonable assurances of success