Appendix C

Comment Letters

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Comment Letters
Napa River and Sonoma Creek Nutrient Delisting

December 16, 2013- January 15, 2014

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January 15, 2014

Mr. Kevin Lunde
San Francisco Bay Regional
Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612
email: klunde@waterboards.ca.gov

RE: Proposed revisions to the 303(d) List of Impaired Water Bodies in the San Francisco Bay Region, Napa River and Sonoma Creek watersheds

Dear Mr. Lunde:

This office represents Ms Chris Malan and the Living Rivers Council (LRC), an advocacy group that uses expert-informed opinion to help guide natural resource policy and regulatory processes and to restore the health of the Napa River and its watershed, regarding this matter.

My clients object to the Board's approval of the these proposed revisions to the list of impaired waters on the ground that the Board has not complied with, or apparently even attempted to apply, the environmental review procedures of the California Environmental Quality Act (CEQA) to this decision.

These proposed revisions are discretionary decisions that will affect the physical environment, therefore, the Board must demonstrate compliance with CEQA before approving the proposed revisions.

Thank you for your attention to this matter.

Very truly yours,

Tom Lippe

Thomas N. Lippe

cc: Ms Chris Malan
Living Rivers Council

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January 10, 2014

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

Re: Proposal to Remove the Napa River and Sonoma Creek from the California Impaired Water Bodies (303d) List for Nutrient Pollution

Dear Kevin,

I am commenting on the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) proposal to remove the Napa River and Sonoma Creek from the California 303d impaired waterbodies list (SFBRWQCB 2013). I am providing these comments on behalf of Ms. Chris Malan and the Living Rivers Council (LRC) (www.livingriverscouncil.org), an advocacy group that uses expert-informed opinion to help guide natural resource policy and regulatory processes and to restore the health of the Napa River and its watershed. I am a consulting fisheries biologist and watershed scientist with 25 years experience in Pacific salmon watershed analysis, including extensive study of the Napa River for LRC for the last several years (Higgins 2006, 2007, 2008a, 2009, 2010). In sum, I do not find the case you are presenting for delisting these waterbodies for nutrient impairment compelling.

Executive Summary

We appreciate the SFBRWQCB staff providing raw data from 2011 and 2012 for the Napa River and Sonoma Creek, but those data and other data presented on your website indicate that many locations show signs of impairment consistent with nuisance algae blooms and nutrient pollution. Poorly buffered Pacific coast freestone streams, such as the Napa River and Sonoma Creek, can manifest nuisance algae blooms with very low levels of phosphorous and nitrogen (Welch et al. 1998). Therefore, lack of high levels of these nutrients does not mean that these waterbodies are not impaired. Also, phosphorous levels measured by the SFBRWQCB commonly exceed levels recognized as those needed to stimulate nuisance levels of algae blooms (Welch et al. 1998).

While the de-listing justification document (SFBRWQCB 2013) states that chlorophyll a data suggest lack of impairment, there are notable exceptions at key mainstem locations on both the Napa River and Sonoma Creek indicative of nuisance algae blooms (N-09, N-55, S-06, S-13, S-36). Overall significance of chlorophyll a data are also difficult to judge because there is no description of shade conditions at monitoring locations that might suppress algal growth.

Continuous raw datasets from 2011-2012 also show dissolved oxygen levels that do not support steelhead trout and COLD beneficial uses at several sites in both basins and are not consistent with de-listing (N-09, N-55, S-36). Data provided by the SFBRWQCB show lethal or near lethal levels for steelhead of dissolved ammonia (>0.025 mg/l) at two locations (N-30, N-25), which clearly is not supporting COLD beneficial use or supportive of delisting arguments.

Stillwater and Dietrich (2002) found that a number of tributaries of the Napa River lost surface flow seasonally and also that a number of stream segments were becoming stagnant and incapable of supporting steelhead juveniles. The SFBRWQCB (2013) report does not reference this study or use data derived there-from, when such comparisons are useful in understanding potential nutrient pollution in the Napa River. SFBRWQCB (2013) also does not fully disclose flow conditions in tributaries where monitoring occurs and refers to streams that lack surface flow as intermittent, when many were historically perennial (Higgins 2010). If streams lack surface flow, then water quality samples do not represent ambient stream conditions but rather site conditions in an isolated segment or pool.

The justification (SFBRWQCB 2013) claims that samples are geographically representative, but there are substantial reaches of both Sonoma Creek and the Napa River that were not monitored. The assumption that nutrient inputs are low in summer overlooks the potential for groundwater conveyance of nutrients from septic systems or agricultural waste that has filtered into the groundwater. Therefore, reaches not sampled could have elevated nutrient levels and be subject to nuisance blooms.

The report (SFBRWQCB 2013) states that there are no Napa River flow trends in recent decades, but we were able to discern a decreasing trend at two Napa River gauges by using the Mann-Kendall time series trend test for 30-day minimums. Declining flow trends we discerned increase the potential for stagnation and associated algae blooms that constitute nutrient pollution as noted in my previous comments for LRC arguing for a Napa River flow impairment designation on the 303d list (Higgins 2010).

My Qualifications

I have been a consulting fisheries biologist and watershed scientist with an office in Arcata, California since 1988. In my 25 year career I have written chapters or elements for several large northern California fisheries and watershed restoration plans, including the Klamath River (Kier Associates 1991), South Fork Trinity River (Pacific Watershed Associates 1994), and Garcia River (Mendocino Resource Conservation District 1992). I also served as lead author of the northwestern California status review of Pacific salmon species on behalf of the Humboldt Chapter of the American Fisheries Society (Higgins et al. 1992).

From 1994-2004 I helped create and populate a regional fisheries, water quality and watershed database known as the Klamath Resource Information System or KRIS (www.krisweb.com). This database covers 2/3 of northwestern California and working on this project has helped me under relationships between watershed management and the response of aquatic ecosystems.

From 2004 to 2010 I worked for the environmental departments of five Lower Klamath Basin Indian Tribes on building a case for Klamath Hydropower Project dam removal and also for better enforcement of the Clean Water Act in order to better protect Tribal Trust resources (see www.klamathwaterquality.com). This involved extensive water quality and nutrient pollution analysis. I assisted with creation of the *Water Quality Control Plan Hoopa Valley Indian Reservation (HVT 2008)*, including setting nutrient standards for the Klamath River.

My previous work for LRC in the Napa River involves TMDL review and timber harvests and vineyard conversions comments, as noted above. I also studied the Napa River when I addressed the problems of over-appropriation and illegal diversion of water in northwestern California on behalf of the Redwood Chapter of the Sierra Club (Higgins 2008b) in commenting on the *Policy for Maintaining Instream Flows in Northern California Coastal Streams* (SWRCB WRD 2008).

From 2006-2010 I supplied technical assistance to the National Marine Fisheries Service to support recovery planning for California south coast and south central coast steelhead (Kier Assoc. and NMFS 2008a) and southern Oregon-northern California coho salmon (Kier and NMFS 2008b). In this capacity I assisted with assimilation of water quality and fish habitat data to assess existing habitat quality and also in setting thresholds for tolerances based on the scientific literature.

The above career experience makes me qualified to judge suitability of Napa River waters for salmonids and also to understand whether a robust case for de-listing the river and Sonoma Creek for nutrients has been provided.

Review of Justification Data and Arguments

The SFBRWQCB (2013) uses 8 different data types or lines of argument for justifying dropping Sonoma Creek and the Napa River from the California 303d list of impaired waterbodies for nutrients. They are ammonia, nitrate, nitrite, benthic chlorophyll a, percent macro-algae cover, pH, dissolved oxygen, and water column chlorophyll a. Not all lines of evidence are reviewed below because only some were inconsistent with de-listing.

Chlorophyll Data

Two types of data involving chlorophyll a were used to test for whether levels had reached those indicative of pollution 1) milligrams of chlorophyll a per square meter of the stream bottom (mg/m^2), and 2) the amount of chlorophyll a in the water column. Since the latter is more appropriate for measuring photosynthetic activity in lakes, it is not discussed further below.

The amount of algae growing on the stream bed can be used as an indicator of pollution and the SFBRWQCB (2013) chose 150 mg/l as the level of impairment based on Tetra Tech (2006). However, Horner et al. (1983) found that 100 mg/l of chlorophyll a could compromise beneficial uses of Pacific coastal streams. Therefore, we display sites on the Napa River (Figure 1) and Sonoma Creek (Figure 2) where values greater than 100 mg/m^2 were measured. The fact that stations at key locations on the main branches of both waterbodies manifest nuisance levels of algae in both 2011 and 2012 is not consistent with delisting them for nutrient pollution. While SFBRWQCB (2013) states that other signs of nutrient pollution that compromise beneficial uses at these sites is not indicated, dissolved oxygen levels are consistent with nutrient pollution and impairment (see below).

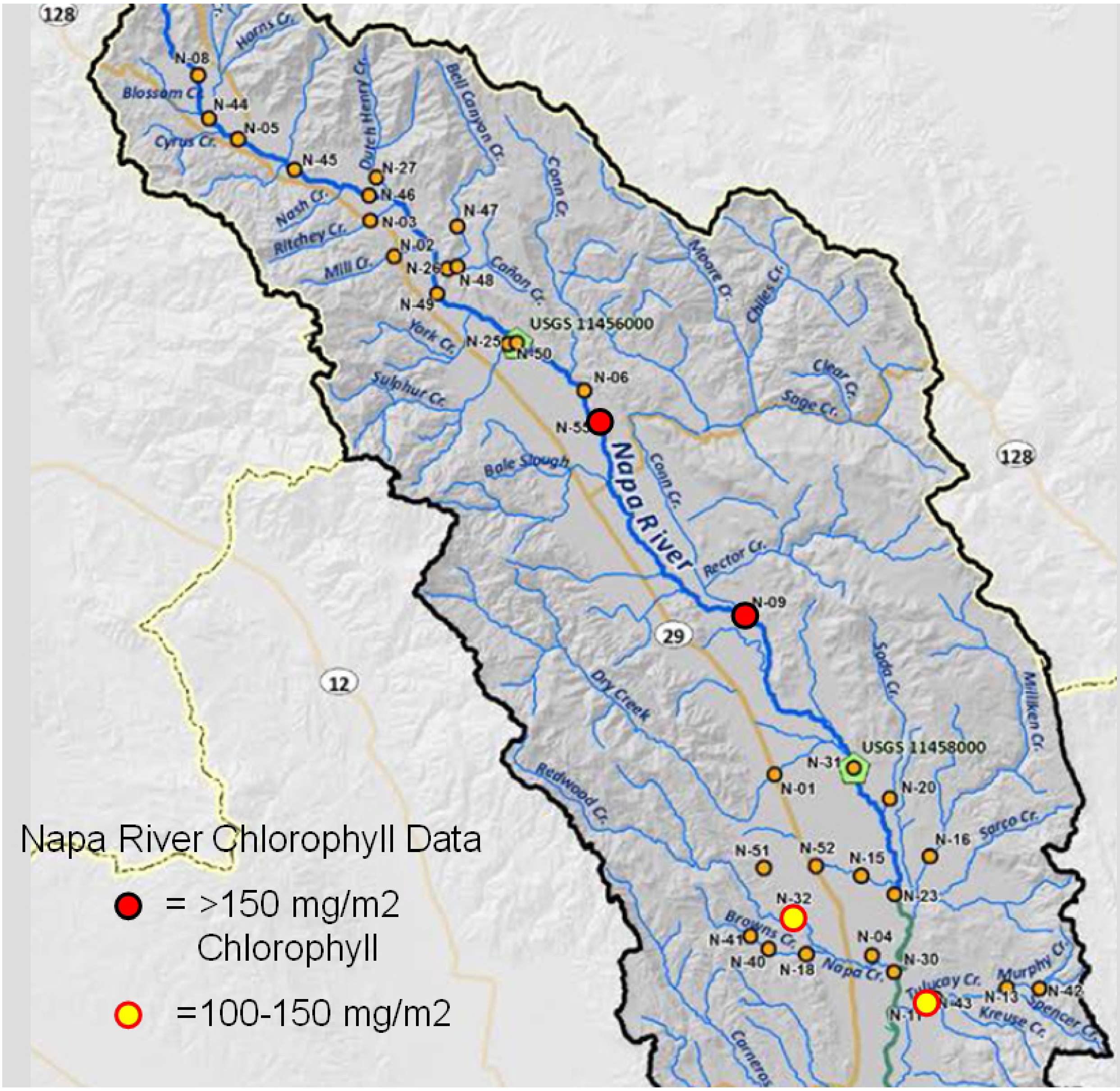

Figure 1. Napa River sites where chlorophyll a was in excess of 100 mg/l. Data from SFBRWQCB (2013).

No problems with algae blooms or high levels of chlorophyll a occur in shaded locations (Welch et al. 1998): “Periphyton in small, shaded streams are usually limited by light and are not likely to reach nuisance levels in response to nutrient enrichment (Purcell 1994).” With regard to the Napa River, the justification report (SFBRWQCB 2013) acknowledges that “Overall the river is well-shaded, but locations with open canopy, warmer temperatures, and shallow waters are more likely to produce algae blooms” and also that the average shade is 71%. Since the report gives no indication of shade at specific monitoring sites, there is no way for the reader to discern whether the low chlorophyll a results are low simply because most monitoring sites were shaded. Similar questions and analytical problems exist for Sonoma Creek chlorophyll a data. Despite the claim that geographic distribution of sites is sufficient (SFBRWQCB 2013), impairment at sites N-55 and N-09 suggest that sites in between the two stations with high chlorophyll a values might manifest similar problems.

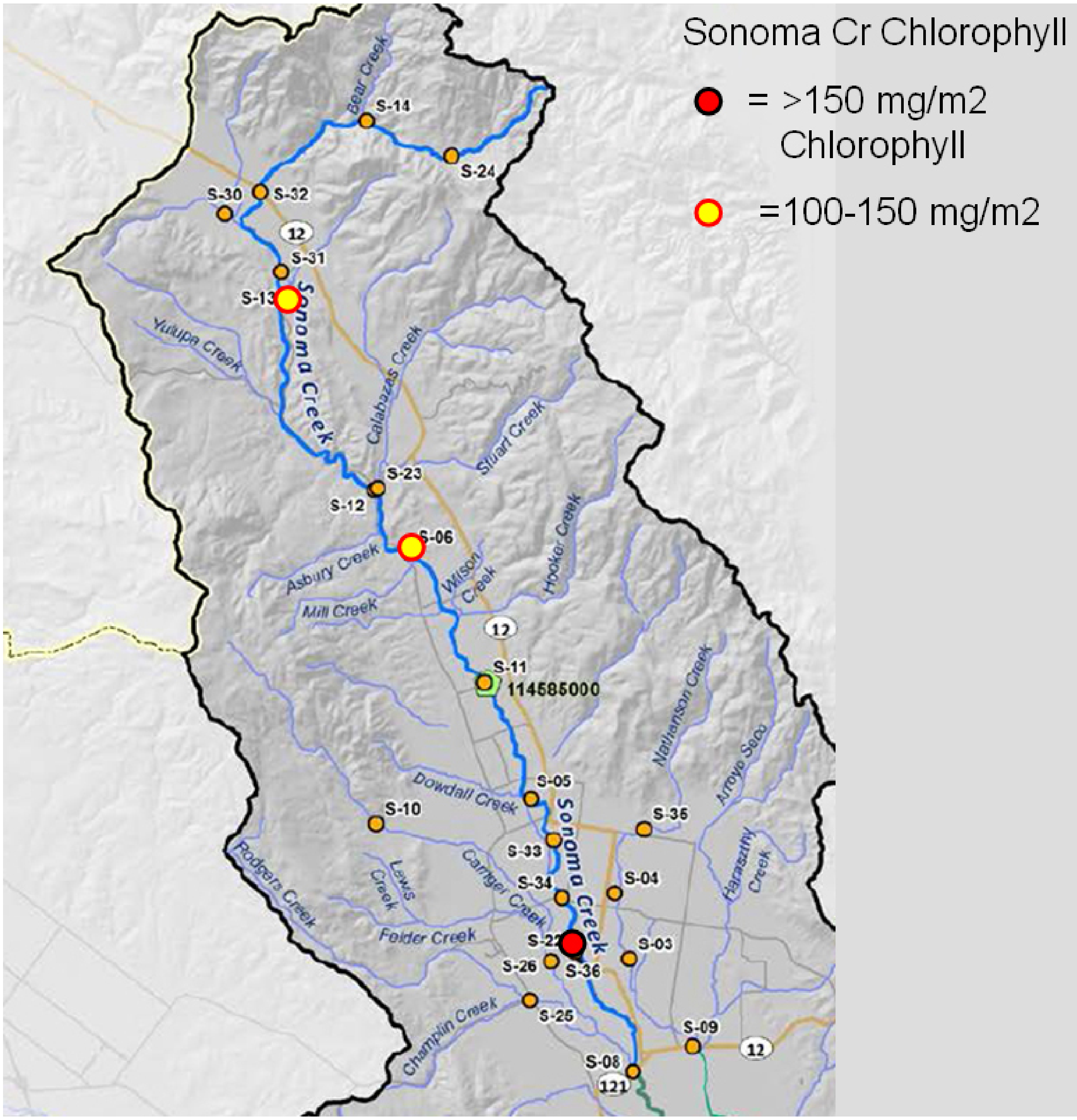

Figure 2. Sonoma Creek sites where chlorophyll a was in excess of 100 mg/l.

Percent Substrate Cover by Algae

The justification report (SFBRWQCB 2013) recognizes benthic algae covers more than 30% of the stream bottom that it is likely impaired with regard to nutrients. Not surprisingly, the sites that exceed chlorophyll a values of 100-150 mg/ m^2 also exhibit algal percent cover values of near 30% or greater (N-09, S-36, S-06, N-32). According to the justification (SFBRWQCB 2013), algae cover at "N-09 increased from 31 percent to 46 percent to 61 percent, showing increased growth throughout the dry season," which indicates high dry season nutrient availability. There are curious results at N-55 where chlorophyll a levels are 161 mg/m^2 but percent cover is less than 7%, but the low D.O. data there are consistent with nutrient impairment and also at sites N-09 and S-36.

Nutrient Criteria

The justification for delisting the Napa River and Sonoma Creek for nutrients (SFBRWQCB 2013) provides data on a nitrogen and phosphorous in different forms to assess levels of nutrient pollution. Discussion here focuses on phosphorous because the levels reported are actually higher than those needed to stimulate nuisance algae blooms at most stations in both basins according to criteria from Welch et al. (1998). Also, dissolved ammonia is discussed because values exceed those known to support salmonids at three locations.

Phosphorous (P): The justification report (SFBRWQCB 2013) states that "the exact nutrient levels at which algal growth limitation begins to occur vary, but are generally less than 0.5 mg/L for total nitrogen or 0.1 mg/L for total phosphorus (Bowie et al. 1985)". Welch et al. (1998) acknowledge that it is difficult to set a lower limit for nutrients in poorly buffered Pacific coastal streams, but found that just 7 to 20 µg of soluble reactive phosphorous (SRP) could trigger nuisance algae blooms. SRP is the equivalent of the SBRWQCB (2013) parameter Ortho-Phosphate as dissolved Phosphorous (mg/L), which has values ranging from 0.004 to 0.250 mg/l. The 0.250 mg/l is the equivalent of 250 ug/l or ten times the amount noted as potentially triggering problems by Welch et al. (1998). The 20 µg/l SRP threshold was exceeded at 79% of the sites in the Napa River and Sonoma Creek, which means dissolved phosphorous is not likely limiting algae blooms and aquatic plant growth in either basin.

Dissolved Ammonia: Plants can readily assimilate ammonium as a source of nitrogen for growth, but at high pH and high water temperatures ammonium may be converted to dissolved or unionized ammonia (Goldman and Horn 1983) that is highly lethal to fish species (U.S. EPA 1986). The justification (SFBRWQCB 2013) states that "The Basin Plan specifies an annual median numeric water quality objective for un-ionized ammonia (NH3), the form of ammonia that is toxic to aquatic life (Water Board 2013). This objective is 0.025 mg/L. No annual measures exceeded this objective." Site N-30 on the lower Napa River at the convergence with Napa Creek had values of 0.026 and 0.024 mg/L on two dates in 2003 and station N-20 on Sulphur Creek attained nearly lethal levels of 0.022 mg/l in the same year. Given that ammonia samples were collected on only a relatively small number of dates, it is likely that even higher concentrations occurred on un-sampled dates. Therefore, these sites manifest highly stressful or lethal conditions for salmonids and data are not consistent with de-listing.

pH

The probe data provided by the SFBRWQCB staff for the 2011 and 2012 period show only modest indications of photosynthetic activity with few pH values over 8.5 (Table 2). The data range narrowly with minimum and maximum values for all sites 6.79 to 8.59. Curiously companion D.O. data for N-09, N-55, S-36, N-32 and S-05 show depressions indicating algal bloom activity and nocturnal respiration or high biological oxygen demand.

Data collected by the San Francisco Estuary Institute (SFEI) in 2003 show pH values consistent with eutrophic or highly eutrophic conditions that would be highly stressful or lethal to salmonids (Wilkie and Wood 1995). The justification report says these data are not reliable and there are no values in the dataset from 2009. This leaves just one hand held 2011-2012 pH value except for the seven sites where continuous recorders were deployed in those years.

Table 2. Maximum and minimum annual pH data from probes deployed by SFBRWQC in 2011 and 2012 in Sonoma Creek and the Napa River.

Location	Max_11	Max_12	Min_11	Min_12
S-05	----	7.92	-----	7.51
S-06	8.24	8.26	7.86	7.94
S-12	8.38	8.5	7.89	8.07
S-36	8.01	8.52	7.58	6.79
N-09	7.93	8.35	7.66	7.67
N-32	-----	8.59	-----	7.71
N-55	-----	7.47	-----	7.24

Laboratory studies indicate show that as water reaches a pH of 9.5, salmonids are acutely stressed and use substantial energy to maintain pH balance in their bloodstream (Wilkie and Wood 1995), while pH in the range of 6.0 to 8.0 is normative. Prolonged exposure to pH levels of 8.5 or greater may exhaust ion exchange capacity at gill membranes and lead to increased alkalinity in the bloodstream of salmonids (Wilkie and Wood 1995). Therefore, any pH over 8.5 is potentially stressful to salmonids. Seven locations on Sonoma Creek had pH greater than 9.5 according to SFEI data and only three sites were under 8.5. On the Napa River, only 17 readings of 60 in 2003 were under 8.5. Spot pH readings in 2011-2012 are not useful for judging diel swings of pH symptomatic of nuisance Therefore, pH data are insufficient for understanding nutrient pollution and do not justify delisting.

Dissolved Oxygen

Many aquatic organisms that have co-evolved in the Napa River and Sonoma Creek require high levels of dissolved oxygen (D.O.), including steelhead trout that are designated as COLD water beneficial uses under the Clean Water Act. Juvenile steelhead trout are known to become stressed and growth slows when D.O. drops below 7 mg/l (WDOE 2002) and levels of D.O. below 3 mg/l are considered lethal (NCRWQCB 2005). Raw continuous recorder data sets collected in 2011 and 2012 were provided by SFBRWQCB staff and minimum and maximum values by location are listed in Table 1 and displayed in Figure 3. Charts of results from locations showing conditions limiting for salmonids are in Appendix A and show that critically low D.O. levels were also accompanied by saturation levels that fell below 50% in some cases, which can also cause salmonid stress (NCRWQCB 2005).

Table 1. Minimum and maximum values for D.O. from various Sonoma Creek (S) and Napa River (N) sites for 2011 and 2012 derived from data recorders.

Site	Max_DO_11	Min_DO_11	Max_DO_12	Min_DO_12
S-12	9.98	7.50	10.32	7.30
S-06	10.11	7.31	9.74	7.03
S-36	10.29	5.28	11.78	0.92
N-32	12.70	5.95	12.31	6.21
N-09	9.74	6.16	11.30	1.61
N-55			6.89	0.11

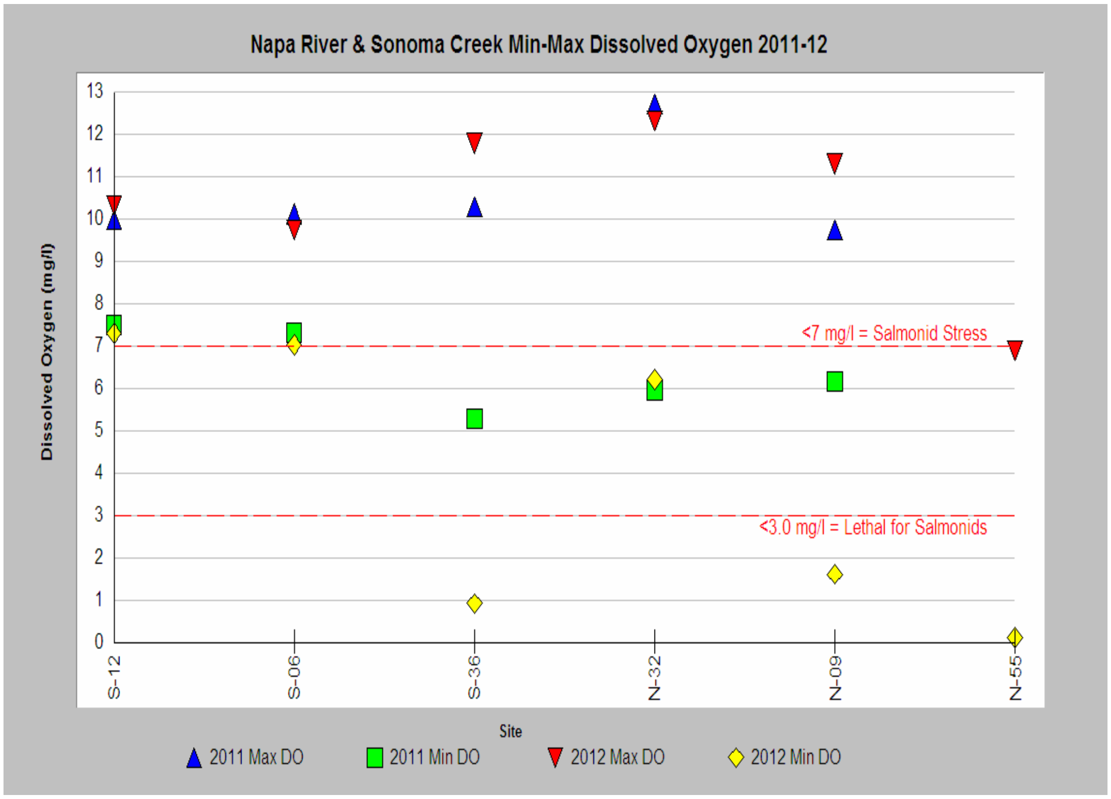

Figure 3. Dissolved oxygen minimum and maximum by year at six sites showing slightly or highly depressed D.O. values. Data from SFBRWQCB. References from WDOE (2002) and NCRWQCB (2005)

Sites S-06 and N-32 had values indicative of salmonid stress (<7 mg/l), while lethal levels of D.O. (<3 mg/l) were measured at sites S-36, N-09 and N-55. Not surprisingly locations like S-06, S-36, N-55 and N-09 also had elevated percent algae cover and/or high chlorophyll a scores consistent with nutrient pollution. Charts from the Excel database for the stations showing the worst D.O. impairment are captured in Appendix A.

Analysis of patterns of D.O. sags at sites S-32, N-09 and N-32 show nocturnal depression suggesting algal respiration that causes stressful conditions for juvenile steelhead (<7 mg/l). Site S-32 is also exhibiting super-saturation of D.O. (maximum DO of 12.3 mg/l on 10/15/2011, which is 137% of saturation at temperature 18.2 °C, see Appendix A), which is indicative of likely diurnal algae blooms.

Flow Trends

Stream flow is an important driver of water quality and fish habitat in the Napa River and Sonoma Creek watersheds. Based on an evaluation of trends in annual stream flow only, SFBRWQCB (2013) stated that there were no trends evident from Napa River flow gauges for the period of record. Solely examining annual flow is inadequate because annual flow largely reflects runoff during the winter and spring, driven by precipitation which is extremely variable from year to year. Water demand for municipal and agricultural uses is low during the months when stream flow is high, and dams and reservoirs capture only a relatively small portion of winter/spring precipitation. In contrast, much of the summer stream flow is withdrawn and used for irrigation. Consequently, the effect of human activities on stream flow is much greater during the summer months than during winter/spring, and it should be expected that long term trends would be much more likely to be detected in summer stream flow than in winter/spring stream flow.

Using available U.S. Geological Survey (USGS) Napa River flow data from Napa (#11458000) and St. Helena (#11456000), an analysis of long-term trends in key metrics of stream flow was conducted using methods similar to those employed by other hydrologic analysis in the region (Madej 2011, Mayer and Naman 2011, Chang et al. 2012). Streamflow metrics calculated for each year included the mean stream flow for each month as well as the minimum 7-day stream flow (i.e., the average stream flow during the 7-day period of the year with the lowest stream flow) and minimum 30-day stream flow. Long-term trends in these metrics were evaluated using the nonparametric Mann–Kendall test, which is commonly used in hydrologic studies (Helsel and Hirsch 2002, Pavelsky and Smith 2006, Mayer and Naman 2011, Chang et al. 2012). Compared to linear regression, the Mann-Kendall test is a more flexible (does not rely on assumptions of normality, constant variance, or linearity) and often more powerful technique for assessing trend (Helsel and Hirsch 2002). A p-value of 0.10 was used as the threshold for statistical significance, the same value used in similar studies (Madej 2011, Chang et al. 2012). The Slope of the trend was calculated using the non-parametric Sen slope estimator method. R software's WQ add-on package was used to run the Mann-Kendall tests and calculate Sen slope. The Mann-Kendall tests do not assess the relative contribution of the various potential causes contributing to the change in streamflow, only their net result. Potential causes include changes in climate (i.e., precipitation patterns and increased air temperature) as well as land and water use (i.e., increased water diversions, groundwater extraction, impoundments, tile drains, and impervious area). The results of the Mann-Kendall trend tests are shown in Table 1.

There are statistically significant declining trends in minimum 30-day average (Figure 4), minimum 7-day average (Figure 5), mean August, and mean September stream flow for the Napa River at St. Helena for both the 1930-2013 and 1960-2013 time periods (Table 1). The steepest drops occurred in mean September and minimum 30-day average stream flow, which both declined at >2% per year over the 1960-2013 period. At the Napa River at Napa gage downstream, declining trends for 1960-2013 were also present in minimum 30-day average (Figure 6) and mean monthly stream flows for September-November (Table 1); while was no statistical trend for minimum 7-day average stream flows at that gage across the entire 1960-2013 period, 7-day average flows have fallen to zero in 12 of 14 years since 2000 (Figure 7).

The only increasing trend was mean June stream flow at the Napa River at Napa gage, which just barely met the threshold for statistical significance (Table 1). No stream flow trends were detected in Sonoma Creek at the Aqua Caliente gage for 1955-2013 except a slight increase in minimum 7-day average flow (Table 1).

The decreases in flow are consistent with what is known about long term water extraction from the Napa River that hydrologist Dennis Jackson (2009) reported. Stillwater and Dietrich (2002) also documented lack of flow and stagnant conditions in the Napa River that was causing conditions limiting juvenile steelhead production. The map of stream flow disruption and stagnation are displayed here as Figure 8.

Table 1. Summary of long-term trends in 14 streamflow metrics at gages in the Napa River and Sonoma Creek watersheds: 7-day minimum flow, 30-day minimum flow, and mean flow for each month. The threshold for statistical significance is a p-value of 0.10.

Gage Name (Gage #)	Time Period Evaluated	Streamflow Metric	Direction of Trend	Sen Slope (cfs/yr)	Sen Slope (%/yr)**	P-value	Statistical Significance Category
NAPA R NR ST HELENA CA (11456000)	1930-2013	Min. 30-day	Decreasing	-0.005	-0.95	0.005	p<0.05
		Min. 7-day	Decreasing	-0.003	-0.73	0.019	p<0.05
		August mean	Decreasing	-0.010	-0.84	0.025	p<0.05
		September mean	Decreasing	-0.008	-0.94	0.005	p<0.05
		Mean for all other months*	no trend				
	1960-2013	Min. 30-day	Decreasing	-0.014	-2.42	0.001	p<0.05
		Min. 7-day	Decreasing	-0.005	-1.27	0.011	p<0.05
		August mean	Decreasing	-0.014	-1.32	0.059	0.05<p<0.10
		September mean	Decreasing	-0.018	-2.25	0.000	p<0.05
		Mean for all other months*	no trend				
NAPA R NR NAPA CA (11458000)	1960-2013	Min. 30-day	Decreasing	-0.014	-1.07	0.056	0.05<p<0.10
		Min. 7-day	no trend				
		June mean	Increasing	0.162	0.86	0.047	p<0.05
		September mean	Decreasing	-0.019	-1.05	0.047	p<0.05
		October mean	Decreasing	-0.050	-0.53	0.060	0.05<p<0.10
		November mean	Decreasing	-0.185	-0.29	0.054	0.05<p<0.10
		Mean for all other months*	no trend				
SONOMA C A AGUA CALIENTE CA (11458500)	1955-2013	Min. 7-day	Increasing	+0.002	+0.48	0.079	0.05<p<0.10
		Min. 30-day	no trend				
		Mean for all months*	no trend				

* To conserve space and increase clarity, only those months with statistically significant trends are listed separately in this table.
** Per-year percent Sen slopes are expressed relative to the median of the entire period, not the beginning of the period.

The SFBRWQCB (2013) termed streams that lack summer surface flow as intermittent, but they were historically perennial (Higgins 2008). The justification (SFBRWQCB 2013) does not provide information on whether monitoring locations are in stream segments that lose surface flow. If they do, then data represent isolated habitats and not ambient water quality conditions of the stream. We are attaching comments related to LRC request for listing of the Napa River for flow and temperature (Higgins 2010) as Appendix B because much of its evidence and many of its arguments are germane to the question at hand.

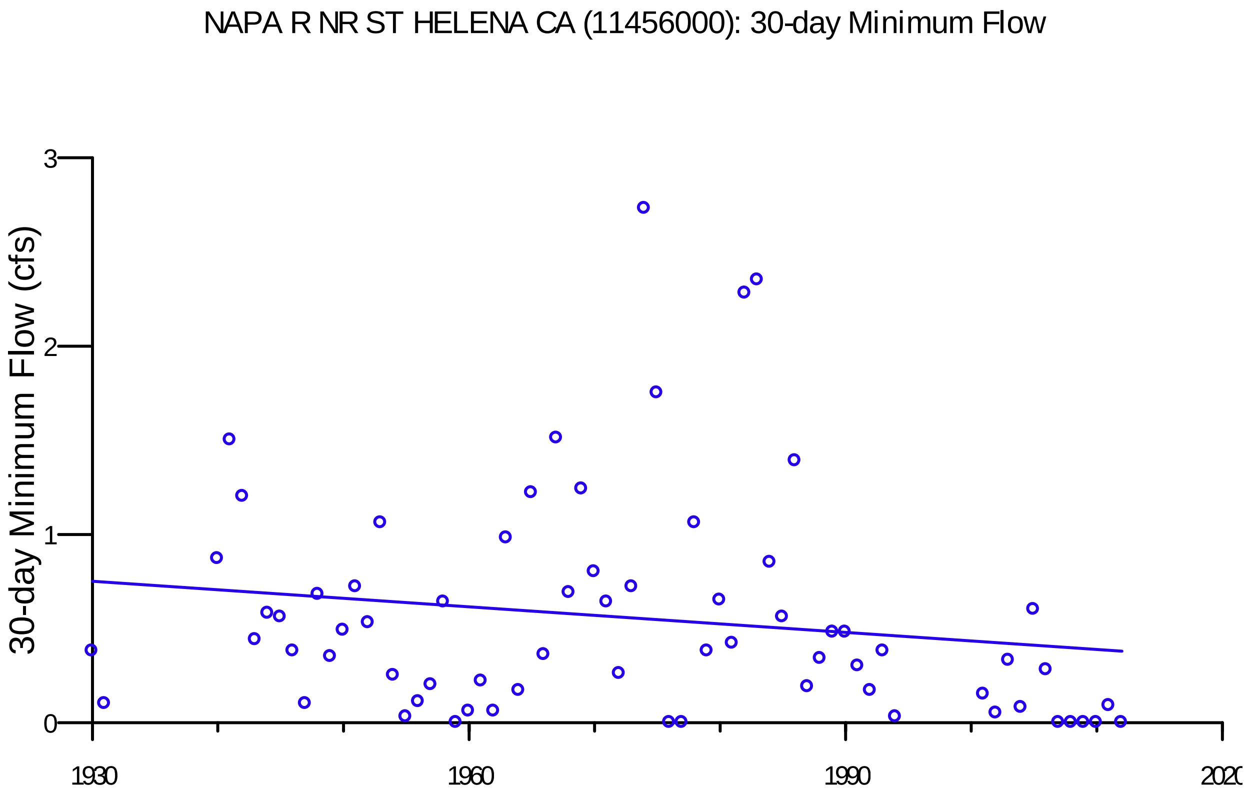

Figure 4. Napa River 30-Day minimum flow trends for the period of record for the USGS St Helena gauge showing a declining trend. The linear trend line is included for graphical purposes only, and its slope differs slightly from the Sen slope shown in Table 1.

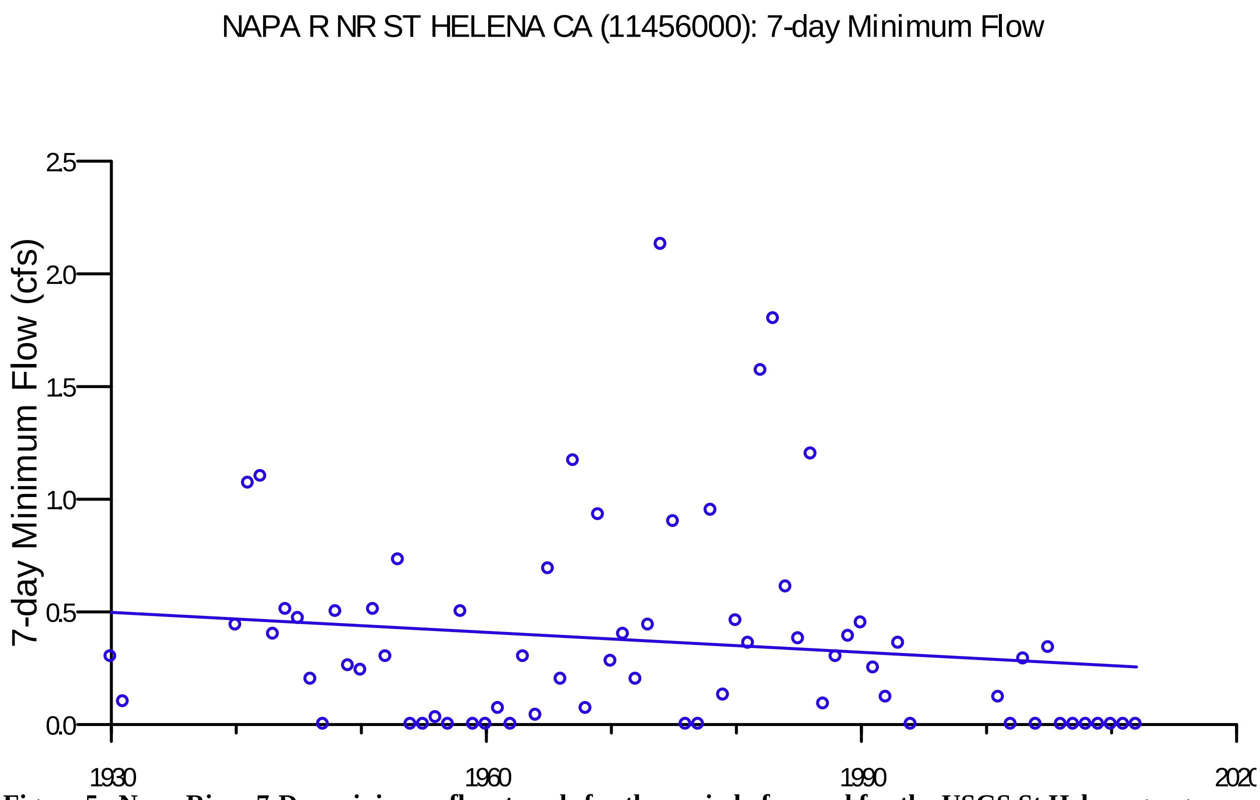

Figure 5. Napa River 7-Day minimum flow trends for the period of record for the USGS St Helena gauge showing a declining trend. The linear trend line is included for graphical purposes only, and its slope differs slightly from the Sen slope shown in Table 1

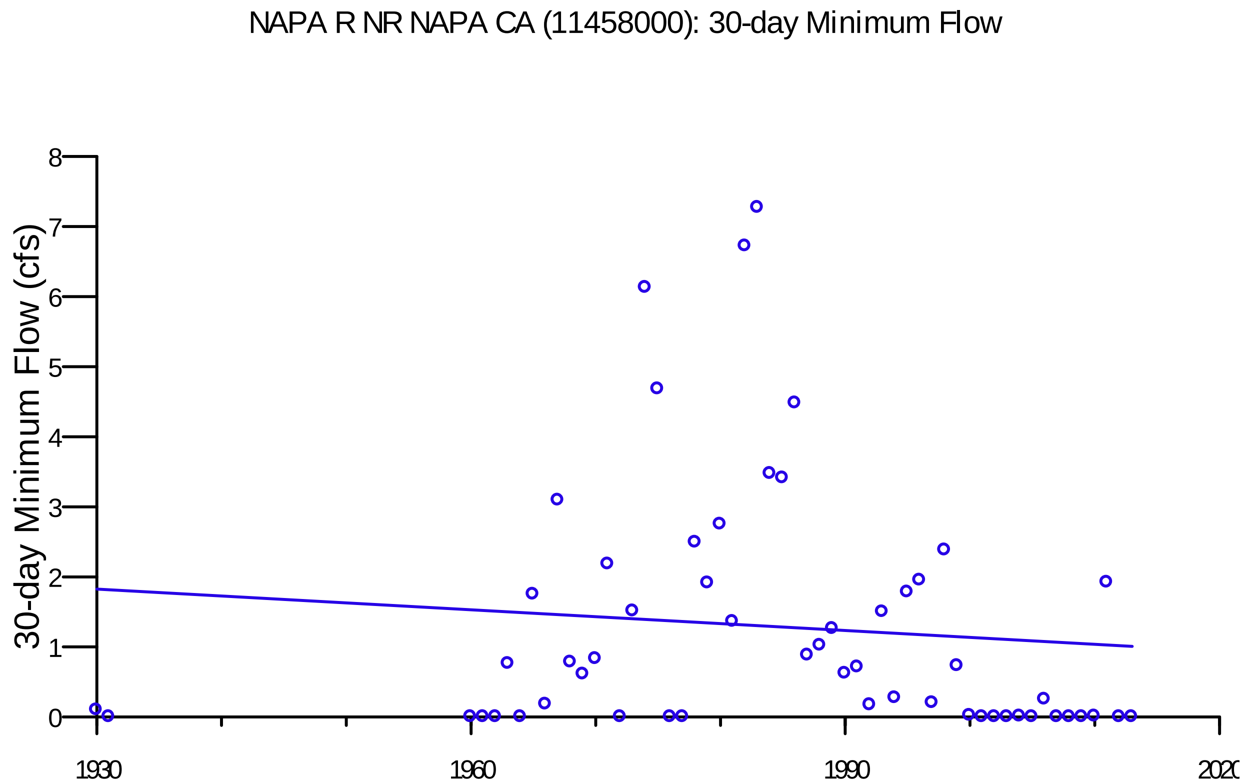

Figure 6. Napa River 30-Day minimum flow trends for the period of record for the USGS Napa gauge showing a declining trend. The linear trend line is included for graphical purposes only, and its slope differs slightly from the Sen slope shown in Table 1.

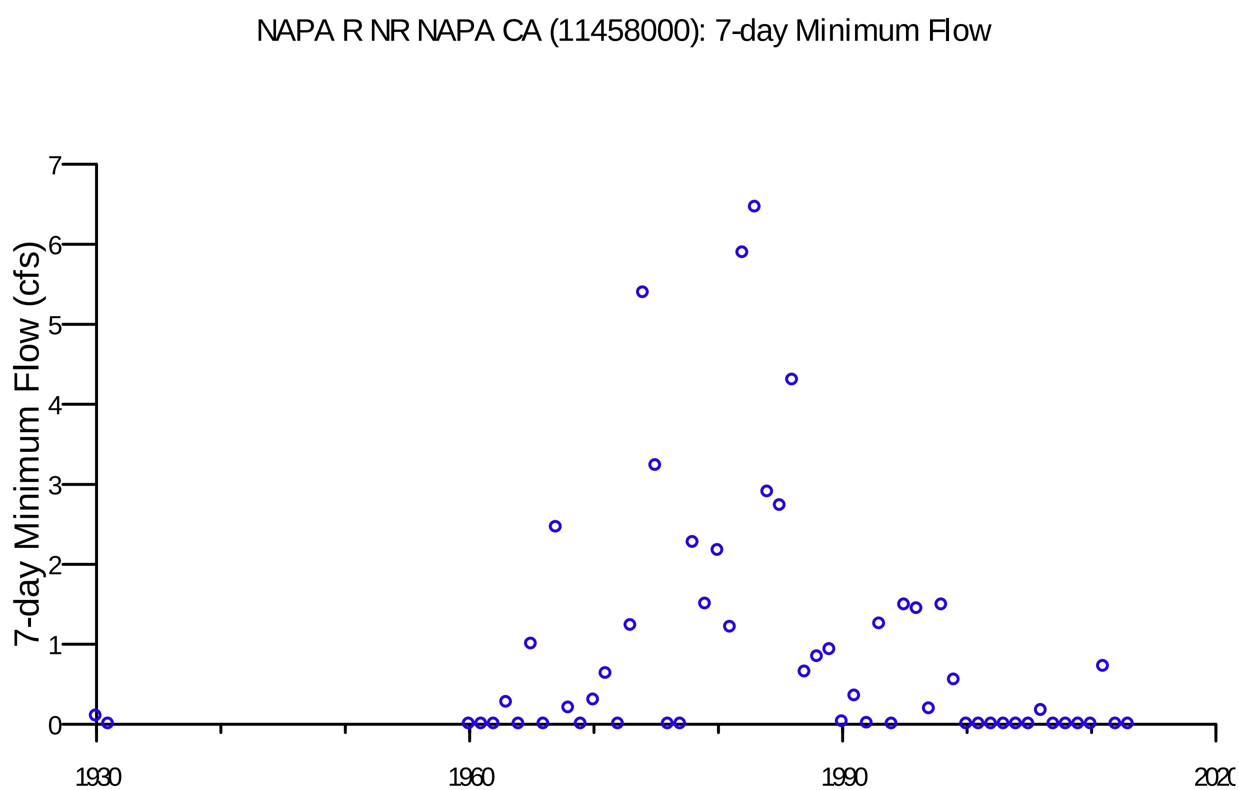

Figure 7. Napa River 7-Day minimum flow trends for the period of record for the USGS Napa gauge.

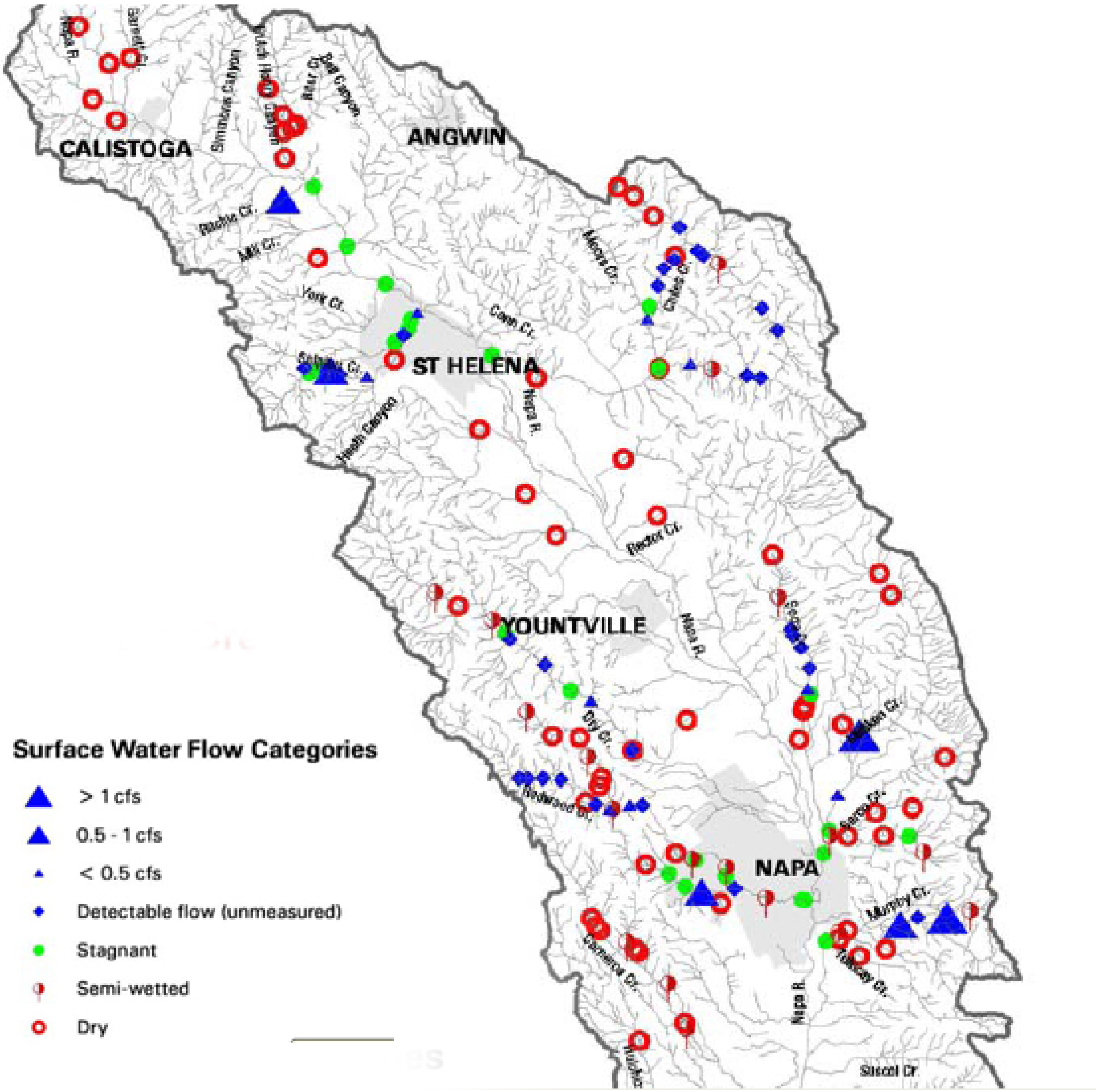

Figure 8. Graphic from Stillwater and Dietrich showing the number of places in the Napa River basin where there were dry stream segments or areas of stream stagnation.

Visual Evidence

The following passage from the justification report (SFBRWQCB 2013) is somewhat ironic:

> "In fact, the evaluation of eutrophic conditions requires the weight of evidence approach because the evaluation process examining a stream's trophic status requires measuring naturally occurring stream organisms (i.e., algae) and determining if the current amount of algae is affecting recreational beneficial uses or water quality parameters that influence aquatic life (e.g., pH, dissolved oxygen)."

In fact, recreational impairment can be visually assessed and Figures 9 shows a photo captured recently by Chris Malan of LRC of the Napa River that shows objectionable algae blooms and the channel choked with vegetation.

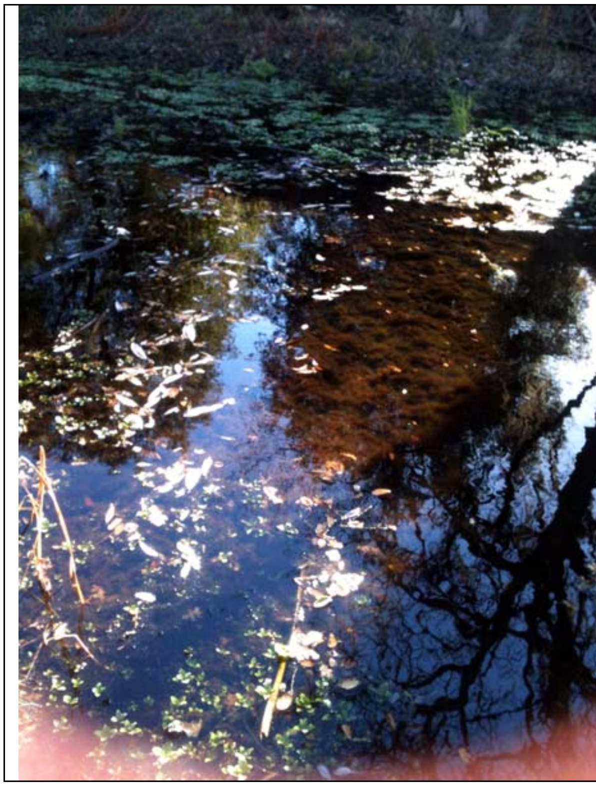

Figure 9. Napa River between at Oakville Road Bridge with floating rafts of vegetation, emergent aquatic vegetation and algae coating the bottom of the stream. These conditions are consistent with high nutrient availability even though the site is partially shaded.

Conclusion

The SFBRWQCB (2013) conclusion to delist the Napa River and Sonoma Creek are not supported by their data and the report does not provide appropriate justification. The flux of flow in the Napa River is now falling to levels where the river has lost its capacity to clean itself and to maintain beneficial uses. The SFBRWQCB needs to take action to restore flow because it is the only means to remediate water quality problems and there is legal precedent for such action. The Board has the authority and to increase flows to meet water quality standards as established in Supreme Court case No. 92-1911 (*Jefferson County PUD and City of Tacoma vs. Washington Dept. of Ecology).* This case explicitly states that water quality authorities under the Clean Water Act can set water quantities sufficient to abate water quality problems:

> "Petitioners also assert more generally that the Clean Water Act is only concerned with water 'quality,' and does not allow the regulation of water 'quantity.' This is an artificial distinction. In many cases, water quantity is closely related to water quality; a sufficient lowering of the water quantity in a body of water could destroy all of its designated uses, be it for drinking water, recreation, navigation or, as here, as a fishery. In any event, there is recognition in the Clean Water Act itself that reduced stream flow, i.e., diminishment of water quantity, can constitute water pollution. First, the Act's definition of pollution as "the man made or man induced alteration of the chemical, physical, biological, and radiological integrity of water" encompasses the effects of reduced water quantity (33 U.S.C. § 1362(19)). This broad conception of pollution – one which expressly evinces Congress' concern with the physical and biological integrity of water – refutes petitioners' assertion that the Act draws a sharp distinction between the regulation of water 'quantity' and water 'quality.' Moreover, §304 of the Act expressly recognizes that water 'pollution' may result from 'changes in the movement, flow, or circulation of any

navigable waters . . . including changes caused by the construction of dams.' (33 U.S.C. § 1314(f)). This concern with the flowage effects of dams and other diversions is also embodied in the EPA regulations, which expressly require existing dams to be operated to attain designated uses (40 CFR § 131.10(g)(4))."

Flow restoration is the only way that the Napa River can come into compliance with the Clean Water Act and be restored to fishable, swimmable and drinkable as required. Flow diminishment tied to increased groundwater withdrawal as documented by Jackson (2009) will confound any attempts of the SFBRWQCB to resolve temperature problems because maintaining cool waters requires higher volume and shorter transit time. Increasing flow would also improve the ability of the Napa River to reduce nitrogen through hyporheic function and also promote connection with cooler groundwater. As noted above, as water warms and pools and shallower habitats stagnate, nuisance algae blooms will continue and worsen. Steelhead trout now inhabit less than 20% of their former habitats in the Napa River basin because of flow diminishment and they too will go extinct if more decisive action in not taken.

The SFBRWQCB (2013) has not provided evidence sufficient for delisting and, in fact, data provided demonstrate nutrient impairment of both the Napa River and Sonoma Creek.

Sincerely,

Patrick Higgins

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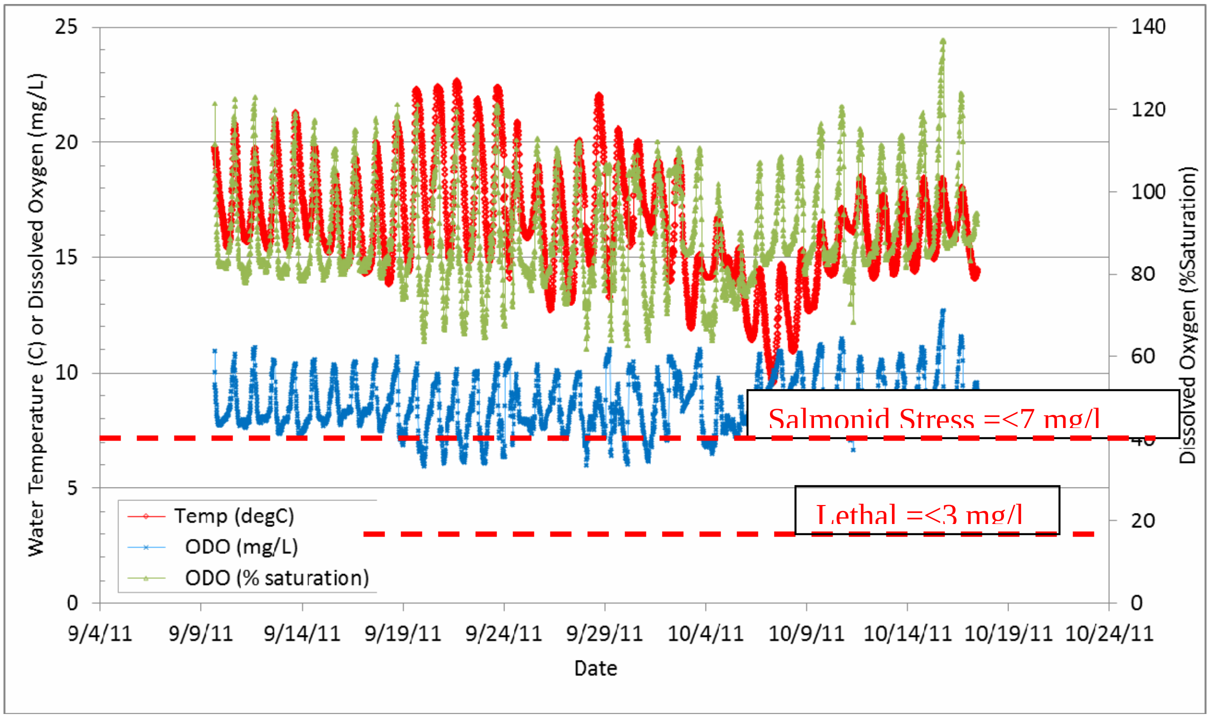
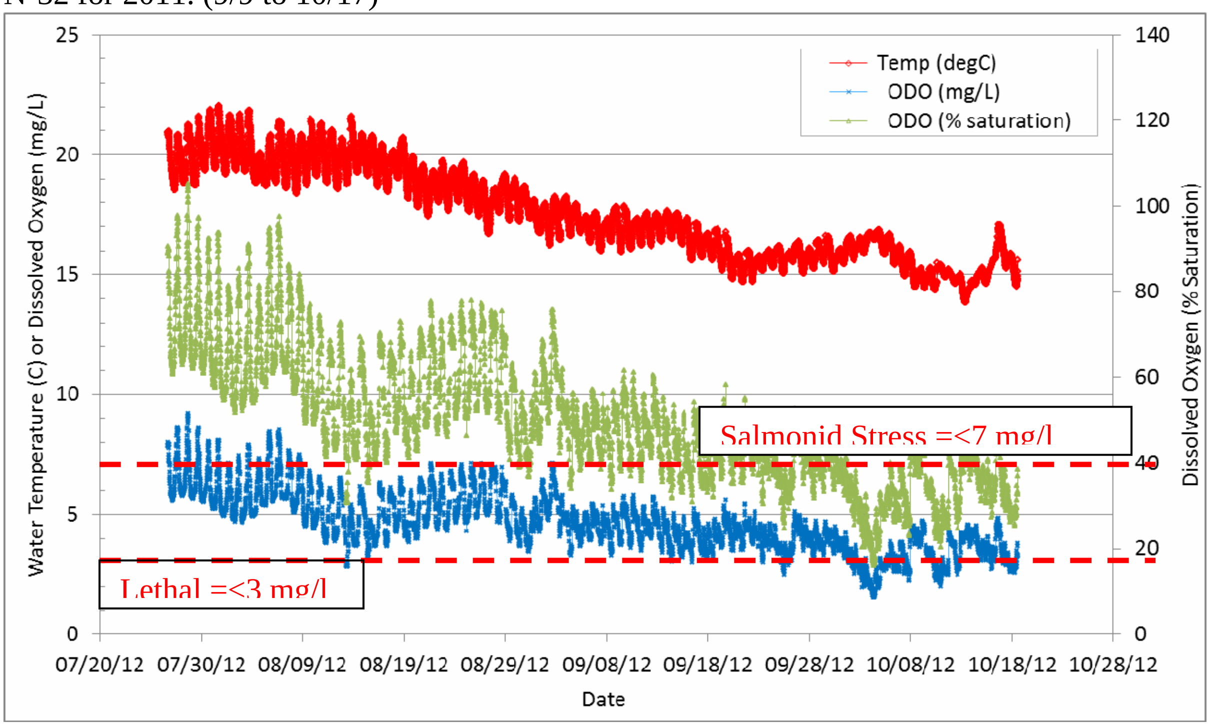
Appendix A

Dissolved oxygen charts from selected Napa River and Sonoma Creek sites showing conditions that do not support beneficial uses. D.O. saturation was calculated based on USGS lookup tables downloaded from: http://water.usgs.gov/software/DOTABLES. Thresholds for D.O. and salmonid health are WDOE (2002) for <7 mg/l as reducing steelhead juvenile growth and NCRWQCB (2005) for lethal designation of 3 mg/l.



N-32 for 2011. (9/9 to 10/17)



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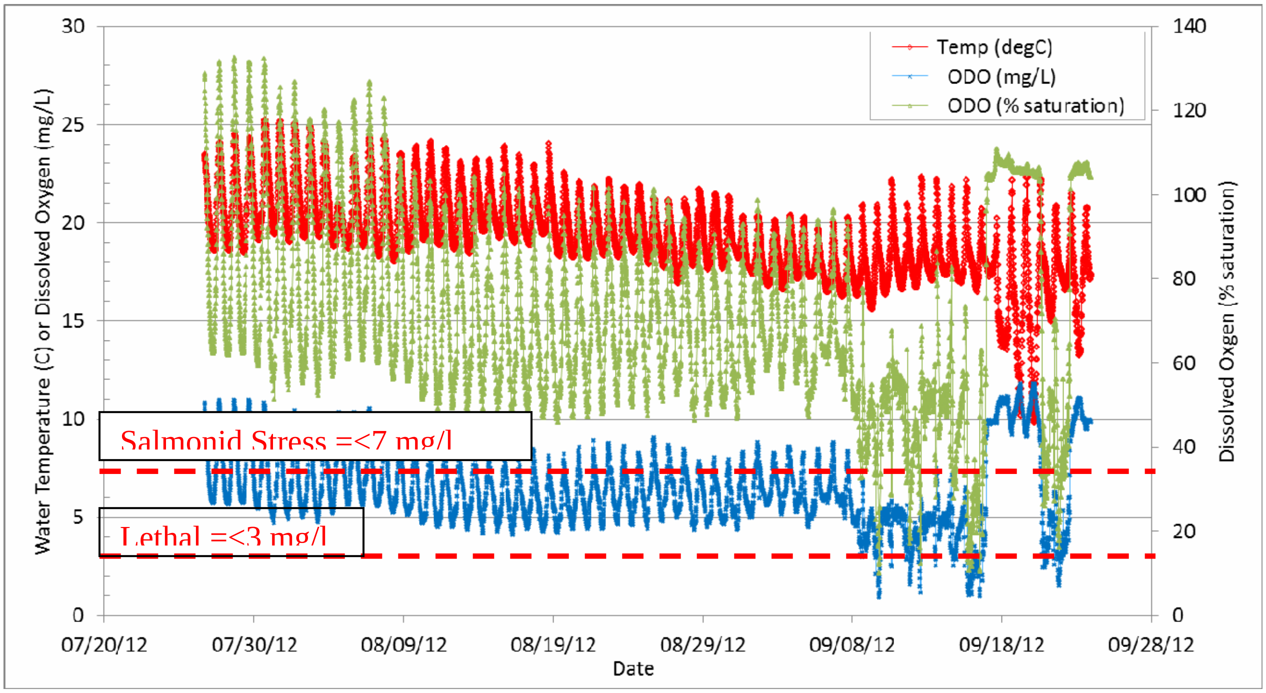

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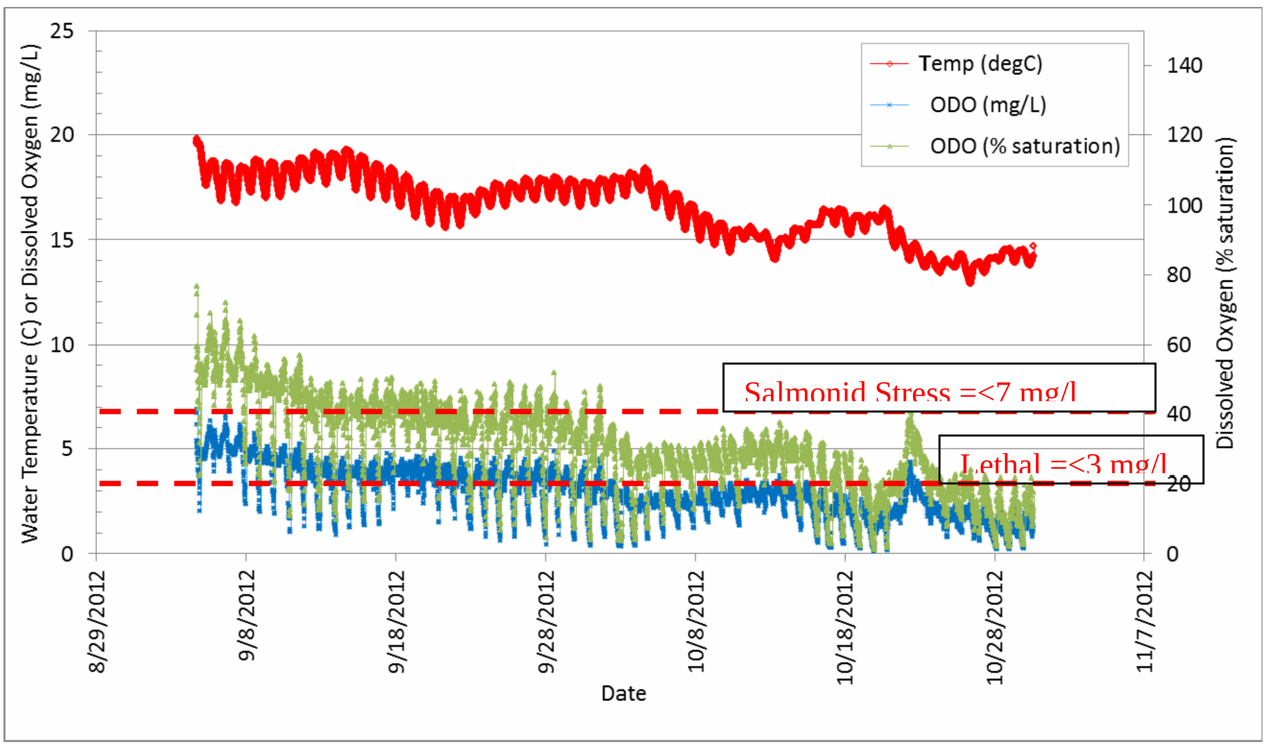

N-55 for 2012 (9/4 to 10/30))

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Mr. Jeffrey Shu
State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95812-0100

Re: Request for Recognition of the Napa River as Flow and Temperature Impaired and Addition to the 2012 California 303d List

Dear Mr. Shu,

These comments are in response to your Notice of Public Solicitation of Water Quality Data and Information for 2012 California Integrated Report [Clean Water Act Sections 305(b) and 303(d)]. I am preparing this request for listing of the Napa River for temperature and flow impairment (including groundwater pumping) for the Living Rivers Council, an advocacy group that uses expert-informed opinion to help guide natural resource policy and regulatory processes and to restore the health of the Napa River and its watershed. Previous listing of more than 100 rivers or stream segments across the nation as impaired due to reduction in flow and groundwater pumping on both the national Clean Water Act 303d list (U.S. EPA 2010) as well as California's (CSWRCB 2006) sets a precedent in recognizing flow depletion as a cause of pollution. I make the case below that the Napa River is temperature impaired because of the reduced volume in mainstem and tributary reaches. Therefore, elevated water temperature problems and loss of cold water fisheries (COLD) beneficial uses cannot be remediated without increasing flows.

I am not submitting new data to argue for this listing of the Napa River because existing data from Stillwater and Dietrich (2003) provide both temperature and flow information sufficient to justify listing for both temperature and flow depletion. I have been studying the Napa River on behalf of the Living Rivers Council since 2006 and I am attaching my previous comments on the Napa River Sediment TMDL (SFBRWQB 2009) and vineyard development projects as an appendix because they also provide arguments that justify the listing request (Higgins 2006a, 2006b, 2007, 2008a, 2008b, 2009, 2010). I am a consulting fisheries biologist with an office in Arcata, California, but I will skip a statement of qualifications here because they are supplied in appendices.

Justification of Listing the Napa River for Flow Impairment

The U.S. EPA (2010) national impaired waterbodies list includes over 101 rivers, stream segments or estuaries where the recognized source of impairment is flow depletion. Causes for listing include flow alteration, hydromodification, pumping and diversion. There is also precedent in California for 303d listing for flow impairment on the Ventura River with pumping and diversion recognized as the causes.

The chronic problems of lack of flow in the Napa River are well studied and extend at least as far back as the 1960s when dams were constructed on the east side of the Napa Valley, blocking access for anadromous fish to approximately 30% of the watershed. Anderson (1969) chronicled problems with insufficient tailwater flows to support steelhead trout below these dams, a condition that persists to this day. USGS flow gauge records from the Napa River show that the mainstem went dry in both the 2001 (Figure 1) and 2004 (Figure 2) water years, which is a very clear case of flow impairment.

While the mainstem Napa River was formerly important nursery area for yearling and older juvenile steelhead (Anderson 1969), today it is more suitable for warmwater species (Stillwater and Dietrich 2002), especially during summer low flow periods. Since steelhead have much higher survival to adulthood in the ocean, if they reside in freshwater for 2-3 years (Barnhart 1989), reduced mainstem rearing habitat poses a major limiting factor on steelhead production in the Napa River. As flow volume decreases, Napa River water is more subject to warming and in the longer term this has caused a shift in the fish community that favors both native and exotic warm water species (Stillwater and Dietrich 2002)(Figure 3). This is evidence of loss of beneficial uses related to cold water fisheries (COLD) and also the need to list the Napa River for temperature and flow impairment.

Stillwater and Dietrich (2004) did extensive stream surveys in the Napa River basin and also found a substantial number of stream reaches that were formerly productive salmonid habitat were dry (Figure 4). Only four stream locations had flows of over 1 cfs and many more had stagnant conditions. These findings are consistent with those of Dewberry (2001, 2003), who also found that low flows or absence of surface flow were limiting the extent of juvenile steelhead rearing habitat. Dewberry (2001, 2003) organized dive counts of steelhead juveniles in many Napa River tributaries in 2001 and 2002 and found that only Dry Creek had consistently high juvenile steelhead standing crops (> 1 fish/meter^2 for >500 meters) in both years. Watersheds of secondary importance included Redwood, Pickle, Richie, Heath, Carneros, Bell and Huichica creeks. Dewberry's (FONR 2004) map of results appears as Figure 5. Even in watersheds where Dewberry (2001, 2003) found high concentrations of steelhead juveniles, there were many reaches in the same creeks with very low densities or no steelhead present. Only 9% of reaches had high concentrations of steelhead in 2001, which was a severe drought year, but these highly productive reaches expanded to only 19% of habitat surveyed in 2002. Steelhead habitat continues to shrink due to increasing water use, and the decline cannot be reversed without restoring flows.

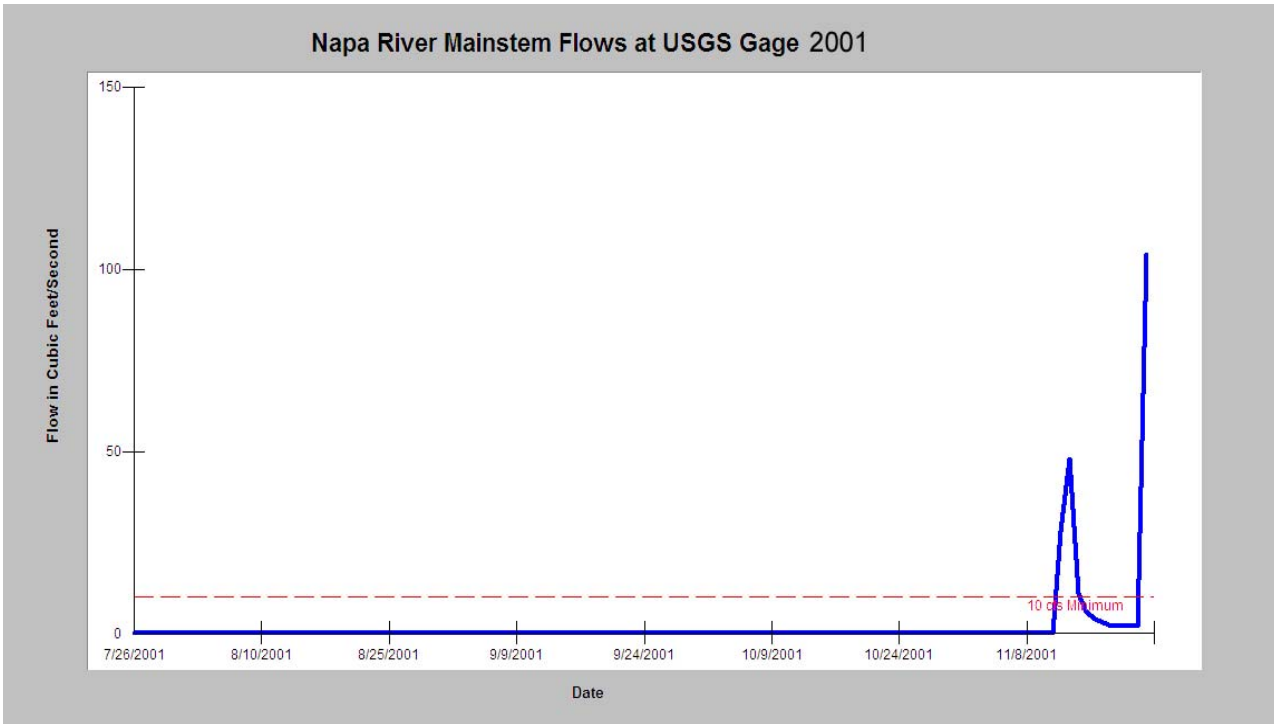


Figure 1. Flow at the USGS Napa River gauge near upstream of Napa show the loss of surface flow throughout the summer and fall of 2001. Data from the CA Data Exchange Center.

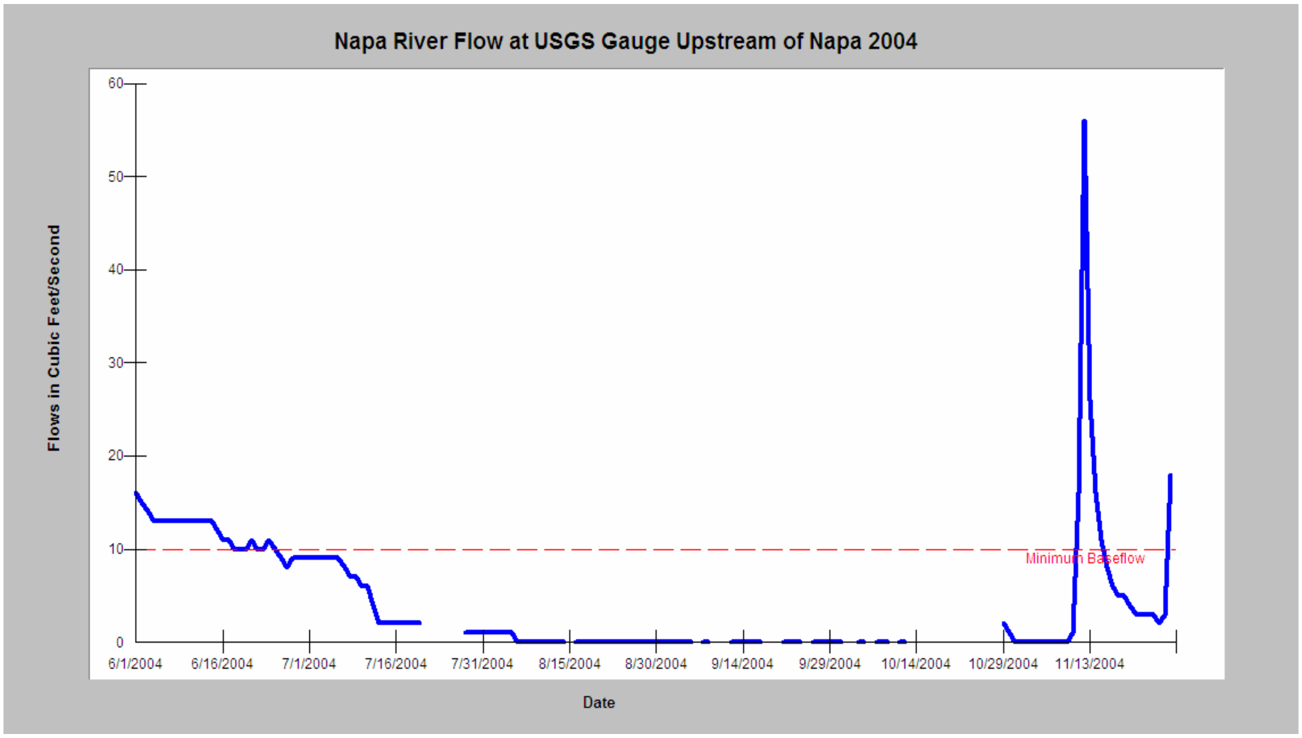


Figure 2. Flow at the USGS Napa River gauge near upstream of Napa shows the loss of surface flow from August through October of 2004. Data from the CA Data Exchange Center.

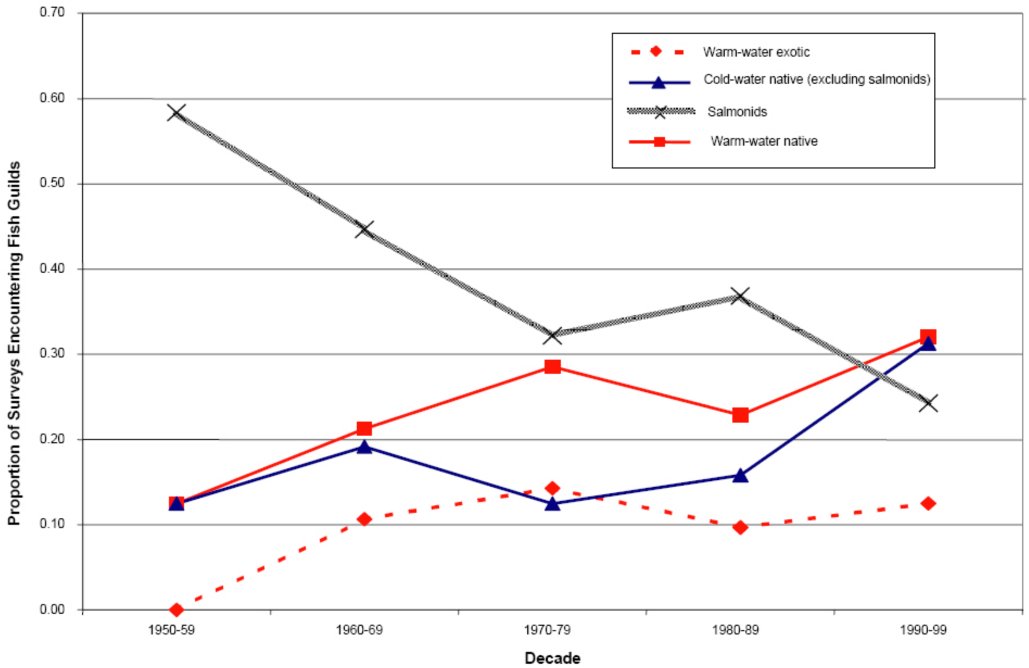


Figure 3. "The average proportion of surveys encountering particular fish guilds (warm-water exotic species, cold-water native species excluding salmonids, salmonids, and warm-water natives) in the mainstem and tributaries of Napa River, by decade." From Stillwater and Dietrich (2002) where is appears as Figure 3-6.

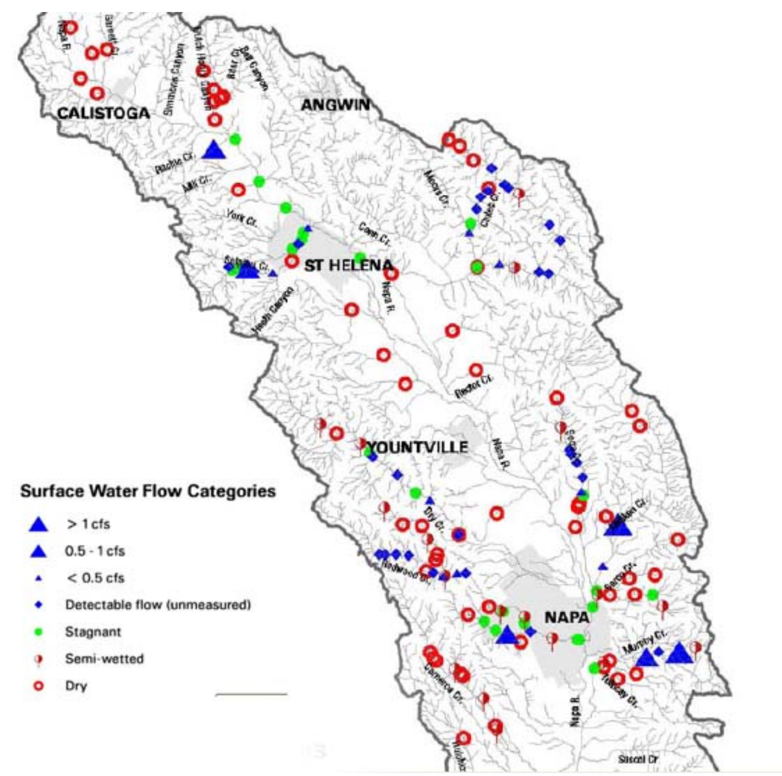


Figure 4. This map image is taken from Stillwater and Dietrich (2002) where it appears as Map 13 and is shown here to illustrate that reaches likely formerly inhabited by salmonids now lack surface flow or are stagnant in other cases because of flow depletion.

Figure 5. Map of reaches of high juvenile steelhead production in the Napa River according to surveys reported by Dewberry (2001, 2003). Map produced by the Friends of the Napa River.

Justification for Listing the Napa River as Temperature Impaired

Stillwater and Dietrich (2002) placed automated temperature probes at over two dozen locations in the Napa River watershed from August 2000 through October 2001 and data from that study are used below to prove temperature impairment with regard to suitability for steelhead.

Water temperature charts below adapted from Stillwater and Dietrich (2002) have thresholds and reference lines indicating showing stressful and lethal levels for Pacific salmon species, including steelhead. The lower reference line is at 20° C (68° F), which is stressful to all salmonids (McCullough 1999) and in the range known to retard steelhead growth (Sullivan et al. 2001). The higher value is 25° C (77° F), which Sullivan et al. (2001) considered to be lethal for most Pacific salmon species. The U.S. EPA (2003) set a target for Pacific salmon core rearing areas in the middle and upper reaches of streams at 16° C/61° F. Migratory routes or non-core rearing areas in middle and lower reaches of salmon streams should maintain temperatures of 18° C/64° F or less. U.S. EPA (2003) recommends an absolute maximum water temperature of 20° C/68° F during adult migration or for juvenile migration and rearing.

Mainstem Napa River: Stillwater and Dietrich (2002) provide water temperatures for several mainstem Napa River locations. Water temperatures are displayed with a central line representing the daily average, but the minimum and maximum daily temperatures reflected as well above and below the average line. Figure 6 shows the mainstem at St. Helena where water temperatures become adverse for salmonids beginning in May and rise above lethal limits in June and July. Downstream at Oak Knoll Avenue in Napa (Figure 7), the pattern of thermal impairment with regard to salmonids is similar with the mainstem Napa River fluctuating into stressful ranges (> 20° C) in May, but maximum temperatures never exceeding 25° C. This may indicate some cool water influence in the reach at Oak Knoll because the Napa River at Trancas Avenue further downstream in the town is once again warmer (Figure 8). Interestingly, the Napa River at the latter location exceeds 25° C for a longer duration than the St. Helena location, with lethal temperatures extending into August and September.

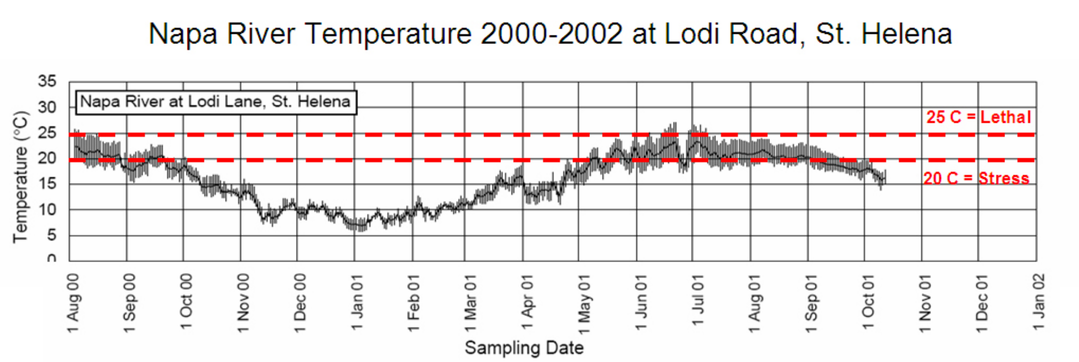


Figure 6. Napa River minimum, average and maximum daily water temperature indicates stressful to lethal conditions for salmonids from late May through mid-September at Lodi Road in St. Helena. Chart adapted from Stillwater and Dietrich (2002).

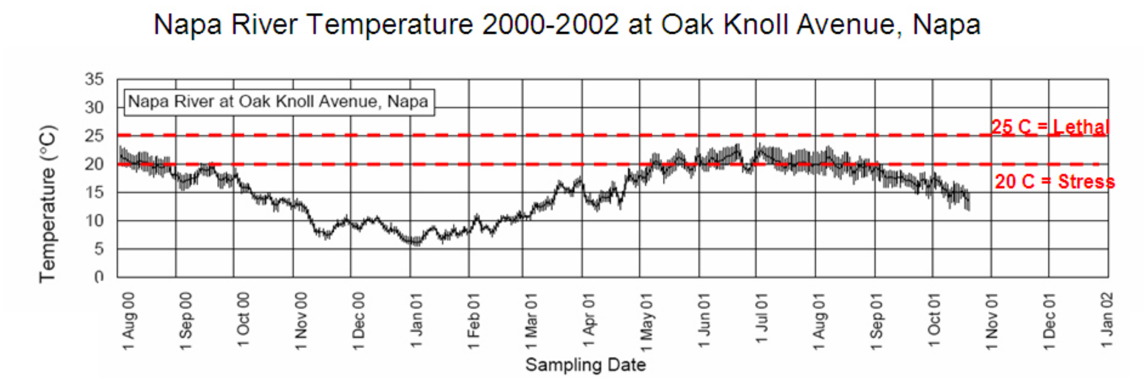


Figure 7. Napa River minimum, average and maximum daily water temperature indicates stressful conditions for salmonids from late May through mid-September 2001 at Oak Knoll Road in Napa. Chart adapted from Stillwater and Dietrich (2002).

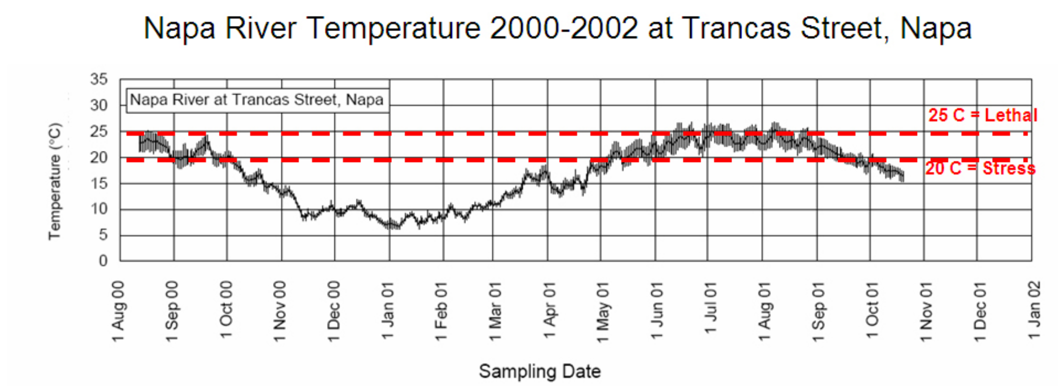


Figure 8. Napa River minimum, average and maximum daily water temperature indicates stressful or lethal conditions for salmonids from late May through mid-September 2001 at Trancas Street in Napa. Chart adapted from Stillwater and Dietrich (2002).

Tributary Impairment: Although Stillwater and Dietrich (2002) found some Napa River tributary reaches had water temperatures suitable for steelhead, they also found some impaired. In some cases, like Middle Carneros Creek, water temperatures appear suitable for steelhead but then stream segments are dewatered (Figure 9). Middle Conn Creek above Hennessey Reservoir shows a similar pattern, where temperatures are mostly suitable for steelhead with maximums only occasionally exceeding 20 ^{o} C, however, data then indicate that the reach was dry from early August to late September 2001 (Figure 10). Middle Sulphur Creek (Figure 11) shows an increase in water temperature to lethal levels (>25 ^{o} C) shortly before the reach went dry in July 2001. This is a typical pattern as flow volume diminishes, water temperature increases. Middle Chiles Creek above Lake Hennessey was also sampled for water temperature by Stillwater and Dietrich (Figure 12) and maximum daily water temperatures only exceeded 25 ^{o} C briefly in June and July 2001, but the range was stressful for salmonids from May through September. Upper Dry Creek water temperature data show very suitable conditions for steelhead juveniles, but then data suggest that the reach goes dry for days or weeks intermittently (Figure 13). Thus, Stillwater and Dietrich (2002) water temperature data demonstrate the need for impaired listing of the Napa River for both temperature and flow.

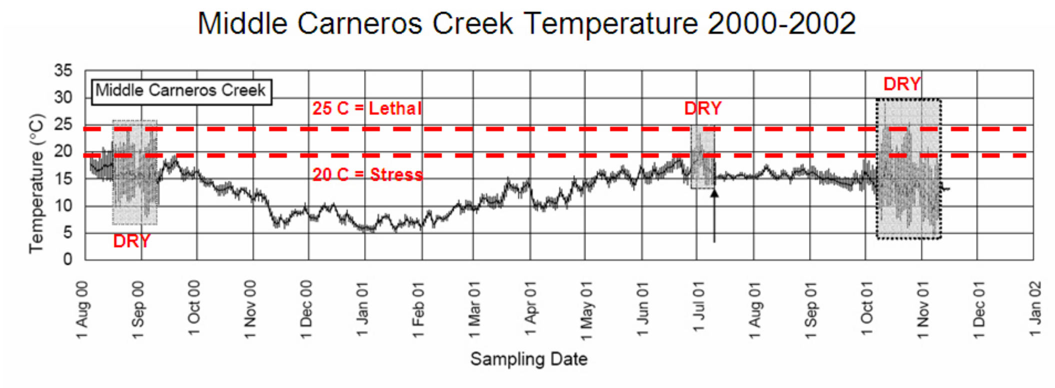


Figure 9. Middle Carneros Creek average, minimum and maximum daily water temperature indicates suitable conditions for salmonids but the reach also went dry intermittently. Chart adapted from Stillwater and Dietrich (2002).

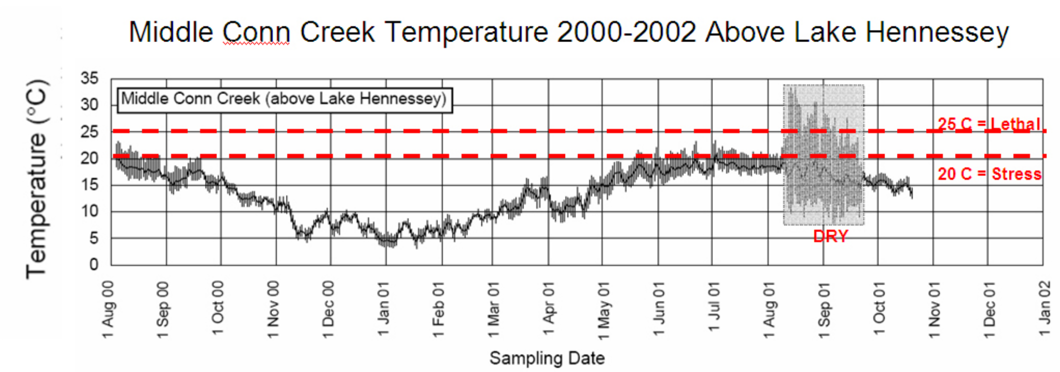


Figure 10. Middle Conn Creek average, minimum and maximum daily water temperature indicates suitable conditions for salmonids with the exception of brief exceedance of 20 C, but the reach also went dry from mid-August to late September 2001. Chart adapted from Stillwater and Dietrich (2002).

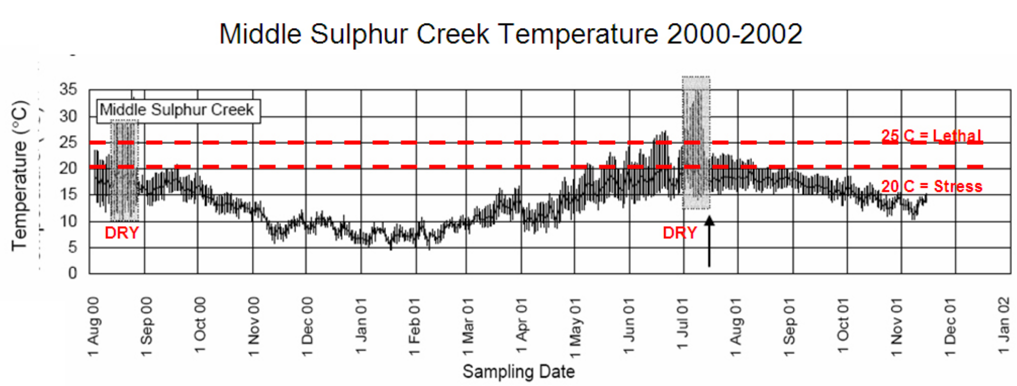


Figure 11. Middle Sulphur Creek average, minimum and maximum daily water temperature indicates periodically stressful conditions for steelhead and that the reach also went dry intermittently. Chart adapted from Stillwater and Dietrich (2002).

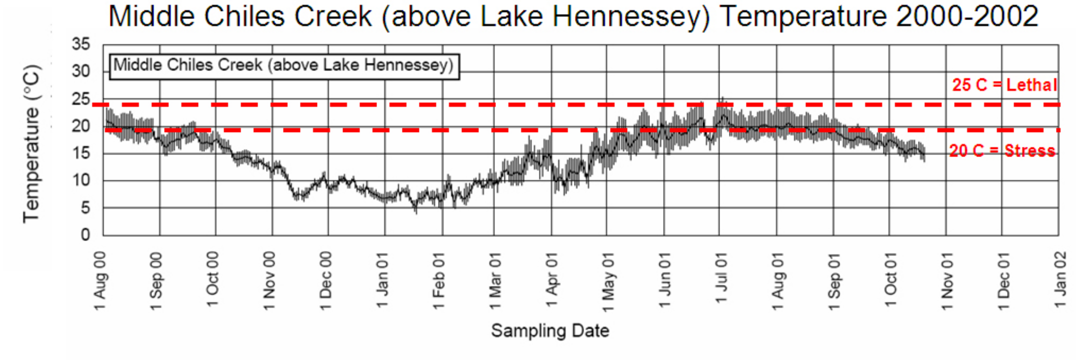


Figure 12. Middle Chiles Creek average, minimum and maximum daily water temperature indicates periodically stressful conditions for steelhead from May through September. Chart adapted from Stillwater and Dietrich (2002).

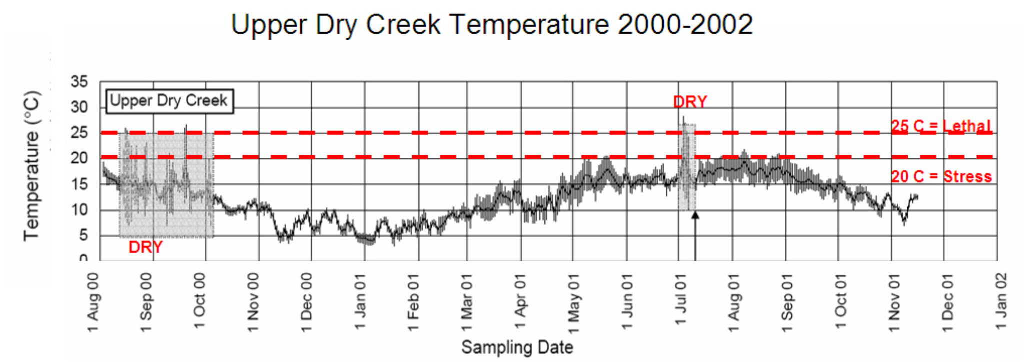


Figure 13. Upper Dry Creek average, minimum and maximum daily water temperature indicates suitable conditions for steelhead but extended periods when the stream went dry. Chart adapted from Stillwater and Dietrich (2002).

Causes of Flow Impairment

There is ample evidence of the cause of flow impairment in the Napa River and what follows is a brief discussion of causal mechanisms for reduced flows that demonstrate that listing causes should include flow alteration, pumping, hydromodification and diversion.

The North Coast Instream Flow Study (Stetson Engineers 2007) found hundreds of legal and illegal (286) diversions in the Napa River (Figure 14) and cumulatively they are dramatically impacting water available for steelhead. These are sources of impairment and suggest the need to list flow alteration and diversion as causes for impairment. Low level aerial images of the Napa River and Carneros Creek (Figures 15 and 16) show dozens of impoundments, but also highly confined stream reaches. Both are channelized, which disconnects both streams from their floodplains and cooling groundwater influence. This suggests that hydromodification needs to be considered as a cause of impairment as well.

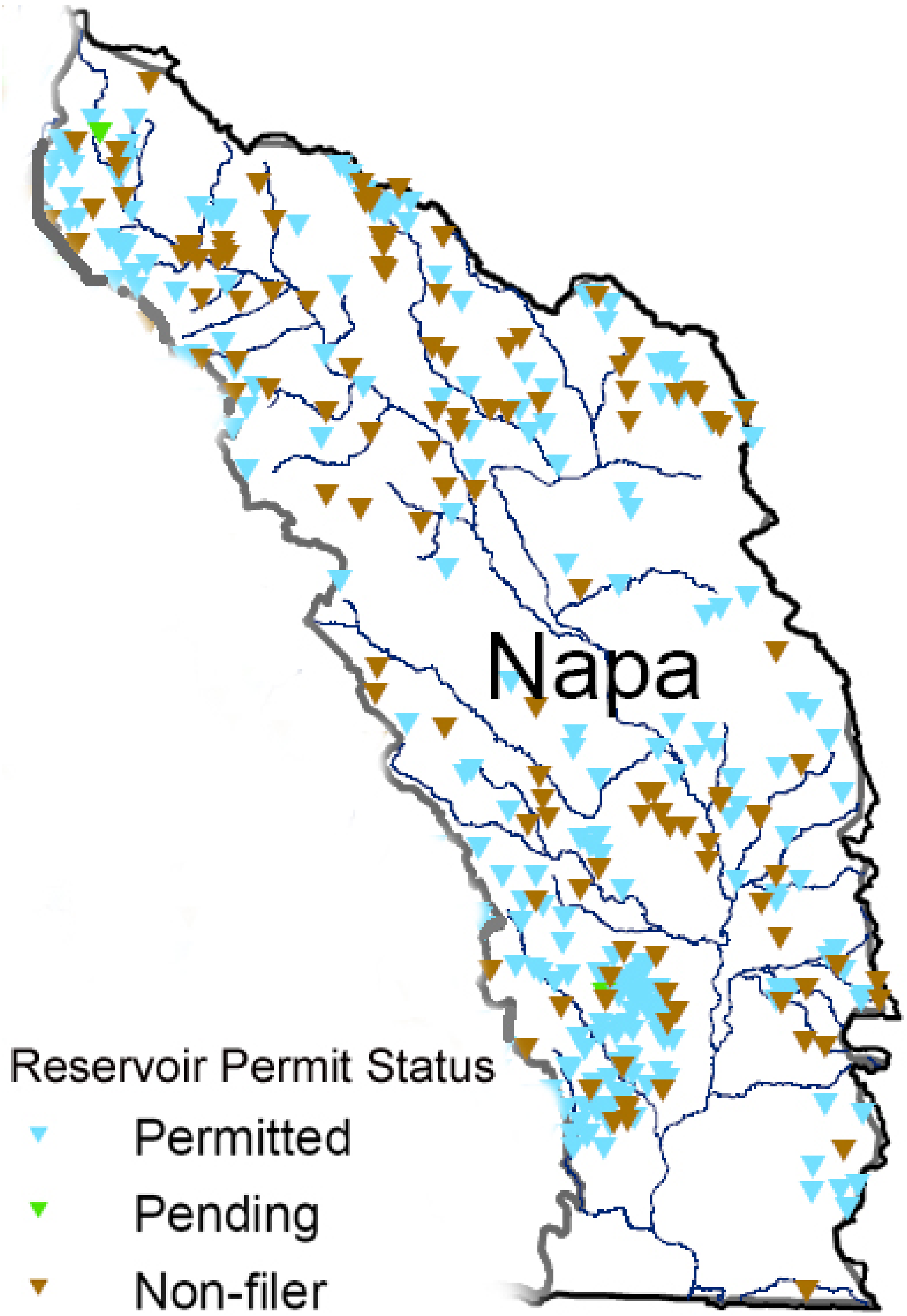


Figure 14. Napa River reservoirs as discerned using aerial photos by Stetson Engineers (2007) with assigned permit status, including a number of illegal diversions (non-filer).

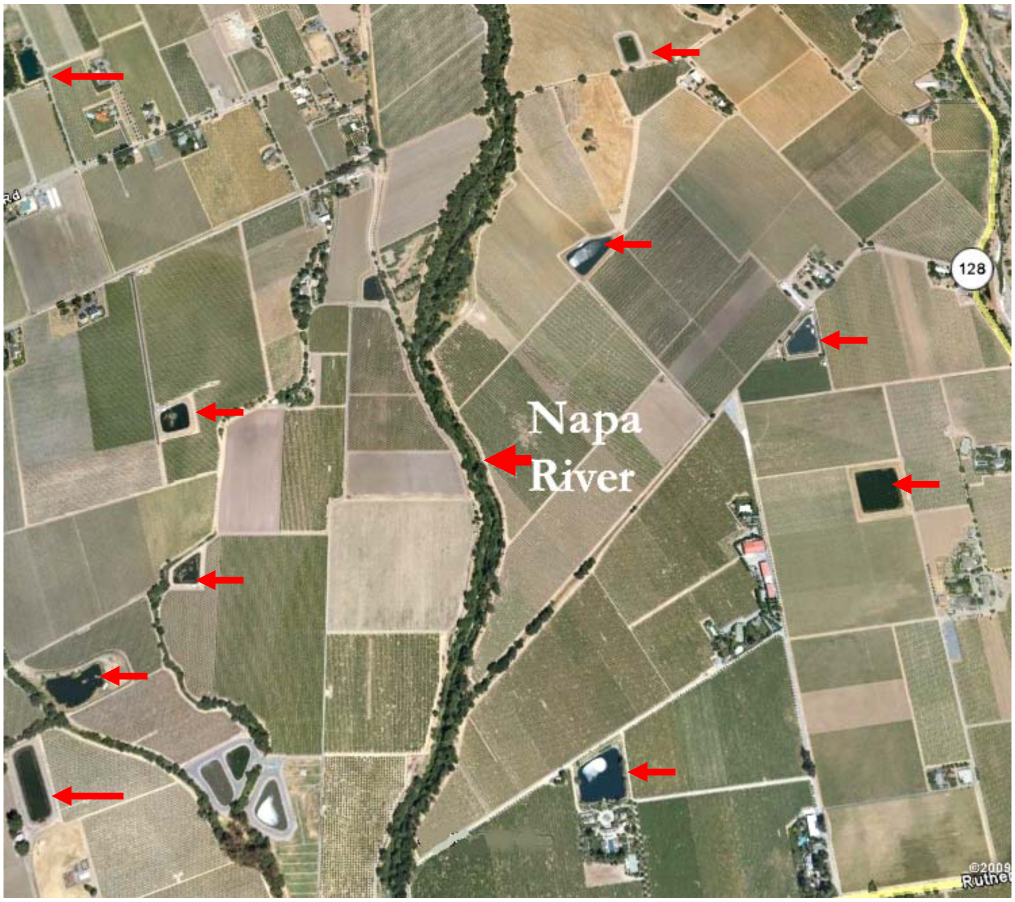


Figure 15. Napa River channelized and disconnected from its flood plain above Rutherford Rd. Note numerous impoundments (red arrows) and very narrow riparian zone. From Google Earth.

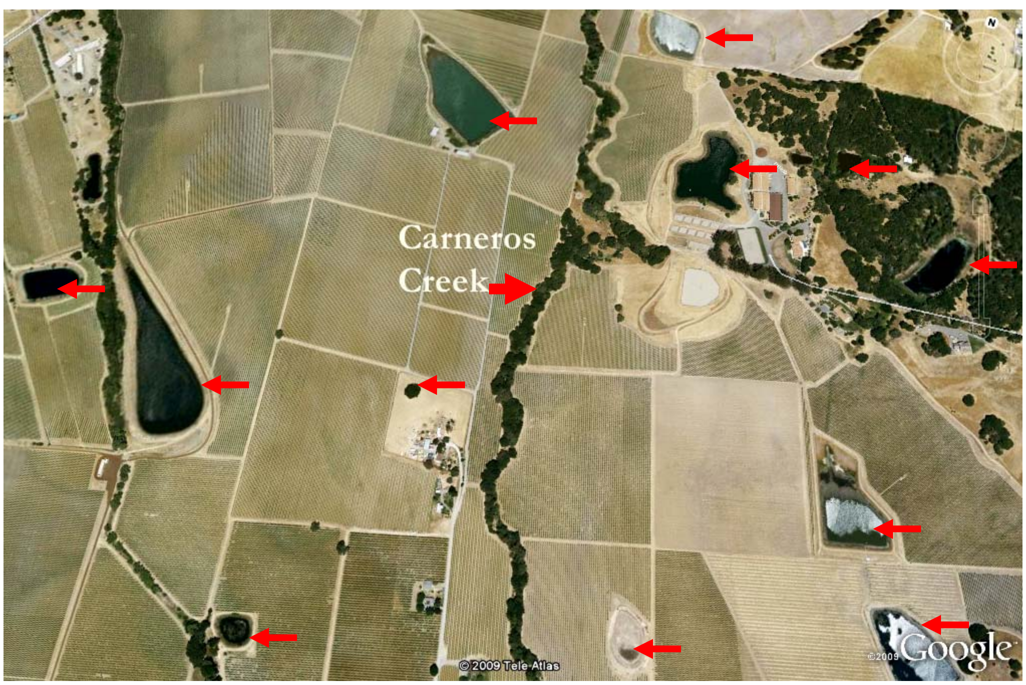


Figure 16. Carneros Creek with channel and riparian conditions similar to the mainstem Napa River. Note that a large number of impoundments (red arrows). From Google Earth.

The comments of hydrologist Dennis Jackson (2009) on the Napa TMDL have substantial bearing on groundwater and pumping issues and are included among the appendices attached. Jackson (2009) referenced groundwater papers by the U.S. Geologic Survey (USGS) (Faye 1973) to show that the Napa River lower mainstem was once a gaining stream. Cold water from tributaries and groundwater increased flows and at the same time moderated water temperatures. Faye (1973) simulated groundwater levels in the Napa Valley using a model and projected that when pumping exceeded 24,000 AF that there would be a reversal of flow from the river bed into the aquifer and that the Napa River would become a losing stream.

Jackson (2009) made the following case that what Faye (1973) projected has come to pass:

> "West Yost and Associates *Technical Memorandum 6* (2005) estimates that the groundwater extraction rate in 2005 was 24,856 acre-feet or 4.2 times the 1970 extraction rate. It is very likely that the current ground water extraction rate from the Napa Valley has increased since 2005. The Napa River was a gaining stream in 1972, meaning that groundwater flowed into the river from the water table. Faye's (1973) conclusions (1) and (2) and his simulation of pumping rates equal to four times the 1970 pumping rate show that groundwater extraction of more than 24,000 acre-feet has the potential to dry up portions of the Napa River during low rainfall years. The 2005 groundwater extraction rate of 24,856 acre-feet exceeded Faye's threshold of 24,000 acre-feet. Therefore, the current rate of groundwater extraction from the Napa Valley groundwater basin is likely contributing to dewatering portions of the mainstem of the Napa River in dry years. Steelhead trout, a federally listed species, are known to inhabit the mainstem of the Napa River so dewatering portions of the mainstem of the Napa River by groundwater pumping would be a very significant adverse impact."

Consequently, pumping should be listed as a cause of Napa River flow impairment on the California updated 2012 303d impaired waterbodies list.

Solution to Abatement of Temperature Problem Same as Shasta River

The National Academy of Science (NAS 2004) in a study of Klamath Basin endangered fishes determined that there was a direct connection between flow depletion and water temperature problems in the Shasta River and that flow augmentation was necessary to remediate the problem:

> "Low flows with long transit times typical of those now occurring in the summer on the Shasta River cause rapid equilibration of water with air temperatures, which produces water temperatures exceeding acute and chronic thresholds for salmonids well above the mouth of the river. Small increases in flow could reduce transit time substantially and thus increase the area of the river that maintains tolerable temperatures."

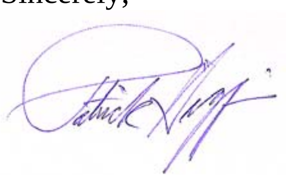
This is also an important part of the solution to temperature pollution abatement on the Napa River and its tributaries. If flows were sufficient to meet temperature tolerances of salmon and steelhead, then habitat would also expand and populations would rebound.

Conclusion

The SWRCB needs to recognize the Napa River as temperature and flow impaired on the California 2012 updated 303d list and should include all flow impairment categories for which there is precedent: flow alteration, hydromodification, pumping and diversion. The support for such action is clearly justified above and it is abundantly clear that Napa River water quality problems cannot be abated nor beneficial uses guaranteed under the Clean Water Act restored without increasing cold water flows.

Please fell free to call me, if you have questions.

Sincerely,



Patrick Higgins

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NAPA COUNTY FARM BUREAU

811 Jefferson Street Napa, California 94559 Telephone 707-224-5403 Fax 707-224-7836

January 14, 2014

Kevin Lunde
San Francisco Bay Regional Water Quality Control Board
1515 Clay St., Suite 1400
Oakland, CA 94612

RE: Support for proposal to delist portions of the Napa River & Sonoma Creek as impaired by nutrients

Dear Mr. Lunde,

Napa County Farm Bureau, a non-profit membership organization representing 878 farmers and ranchers in Napa County, offers support for the recommendation to delist the Napa River and Sonoma Creek as impaired by nutrients and appropriately revise the 303(d) list of impaired water bodies.

We have reviewed the staff report and research data and agree with the conclusion on page 4 of the staff report that states, "In sum, we conclude that water quality conditions in the Napa River and Sonoma Creek are meeting the narrative biostimulatory Water Quality Objectives with respect to nutrients and eutrophication. Staff's analysis has determined that these water bodies are supporting designated beneficial uses that could be affected by nutrients for which there are numeric evaluation guidelines. Therefore, we propose to delist the non-tidal portion of the Napa River main stem and Sonoma Creek main stem for impairment caused by nutrients."

We believe the Water Board was diligent and thorough in the research on the nutrient conditions which was conducted over a ten year process from 2002 to 2012. The staff report states that the review included 1) compiling all known existing data related to nutrients and algae growth in the watershed, 2) collection of additional data on benthic algae in a manner consistent with the State Water Board's nutrient numeric endpoint guidance (Tetra Tech 2006), 3) creation of eight lines of evidence to evaluate all relevant available data and 4) a proposal to refine the nature and scope of the beneficial use impairment in the Napa River based on the findings .

With our community's focus of responsible stewardship on our natural resources, we are heartened by the reduction in nuisance algae levels and we agree that this was most likely a cumulative effect of NPDES permit restrictions on wastewater discharges, changes in land use in the River's watershed over the past 30 years and improved agricultural best management practices (BMPs). As agriculturists, we remain committed to sustainable agriculture, operating our farms and ranches with a keen awareness of the critical importance impacts of our farming practices and an awareness of the critical importance of protecting water quality in the watersheds of our county.

Thank you for the opportunity to comment.

Sincerely,

Norma J. Tofanelli

Norma Tofanelli
President

Jim Lincoln
Natural Resources Committee Chairman

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Napa County Flood Control and Water Conservation District

PHILLIP M. MILLER, P.E.
DISTRICT ENGINEER

A Tradition of Stewardship
A Commitment to Service

January 9, 2014

Kevin Lunde
San Francisco Bay Regional Water Quality Control Board
1600 Clay Street, Suite 1400
Oakland, CA 94612

Subject: Comment Letter – Proposed Revisions to the 303(d) list of Impaired Water Bodies in the San Francisco Bay Region, Napa River and Sonoma Creek Watersheds

Dear Mr. Lunde:

Thank you for the opportunity to comment on the proposal to remove freshwater portions of the Napa River and Sonoma Creek from the 303(d) list for nutrients.

We very much appreciate the work undertaken by staff of the Surface Water Ambient Monitoring Program (SWAMP) as well as staff of the San Francisco Estuary Institute over the last decade to collect and evaluate the copious amounts of data which led to the proposed de-listing.

We concur with the Waterboard's conclusion that the weight of evidence clearly demonstrates that Water Quality Objectives are being met and support the de-listing. More importantly, we are very pleased to know that all the beneficial uses which could be affected by nutrients are being supported within the Napa River and consider the de-

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listing an important milestone that recognizes the success of our many water quality improvement efforts in Napa County.

Sincerely,

Phillip M. Miller, PE
District Engineer