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July 3, 2009

Mr. Thomas Lippe
329 Bryant Street, Suite 3D
San Francisco, CA 94107

Re: Proposed Basin Plan Amendment and Napa River Sediment Total Maximum Daily Load TMDL and Adequacy of Implementation for Protecting and Restoring Pacific Salmon (Cold Water Beneficial Use)

Dear Mr. Lippe,

I provide the comments below at your request and on behalf of your client, the Living Rivers Council (LRC). My area of expertise is salmon and steelhead conservation and restoration; therefore, my comments regarding the *Napa River Watershed Sediment TMDL and Habitat Enhancement Plan: Staff Report* (Napolitano et al. 2009) (Napa TMDL) and Basin Plan Amendment or *Napa River Sediment Reduction and Habitat Enhancement Plan* (SFBRWQCB 2009) are focused on whether recommended actions are sufficient to maintain and restore Pacific salmon species. I will not restate my qualifications here because they are included previous comments that are being filed, however, between September 2008 and the present I have been assisting the National Marine Fisheries Service (NMFS) with coho salmon recovery planning in southwest Oregon and have become intimately familiar with scientific literature on Pacific salmon restoration (Reeves et al., 1995, Doppelt et al. 1993, Bradbury et al. 1995). The Napa TMDL implementation does not conform to "best science" on the subject and, consequently, has little chance of restoring Chinook salmon and steelhead trout.

I recommend that as you file these with the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) that you include previous comments that I have prepared for you on the Napa TMDL (Higgins 2006a, 2008a) and also on timber harvests and vineyard conversions (Higgins 2006b, 2007) within the Napa River watershed that are relevant because of discussion of cumulative watershed effects. I am also attaching my comments on the *Draft Policy for Maintaining Instream Flows in Northern California Coastal Streams* (SWRCB 2008) prepared for the Redwood Chapter of the Sierra Club because they cover the Napa River watershed and the issues discussed have substantial overlap with TMDL implementation. Comments on a negative declaration proposed for a Sonoma County winery development project in the Maacama Creek watershed (Higgins 2009) are also attached because the creek shares its headwaters with the Napa River. Maacama Creek has similar water supply problems to the Napa River including widespread unpermitted water use, but impacts to fisheries and fish habitat are better studied.

Summary

Overall the response to my previous comments by SFBRWQCB staff (Napolitano et al. 2009) have been inadequate and major issues in the final TMDL and Basin Plan Amendment remain unresolved. The goals as stated in the Basin Plan Amendment (SFBRWQCB 2009) for the Napa River TMDL are to:

- Conserve the steelhead trout population
- Establish a self-sustaining Chinook salmon population
- Enhance the overall health of the native fish community

None of these goals are likely to be met unless watershed processes are restored (Reeves et al. 1995) and further watershed damage is limited (Kauffman et al. 1997). I have described cumulative effects in the Napa River basin due to upland management in past comments (Higgins 2006a), and will touch on this subject again below, but hydrologic cumulative effects on Chinook salmon and steelhead are even more profound and receive more emphasis here. Unless illegal impoundments and groundwater withdrawal are dramatically decreased, salmonid populations will not be recovered and other beneficial uses will continue to be compromised (i.e. recreation). Elevated peak flows due to profound alteration of watershed hydrology and channel confinement will continue to cause downcutting that will also confound abatement of sediment problems (SFEI 2007) under the Napa TMDL because recommended actions are insufficient (Jackson 2009). Bradbury et al. (1995) emphasize the importance of protecting viable Pacific salmon habitat because that is where functioning populations remain, but in the Napa River watershed all the State and federal agencies have failed in aggregate to perform this function. Monitoring is still deficient and would not support adaptive management, which is being invoked by the Napa TMDL (Napolitano et al. 2009) and Basin Plan Amendment (SFRWQCB 2009), but not practiced in a meaningful way (Walters and Hilborn 1978, Walters and Holling 1990, Waters 1997, NRC 2004).

Status of Napa Fish Populations and Re-Statement of Limiting Factors

As established by my previous comments (Higgins 2006a, 2006b, 2007, 2008b), Pacific salmon species are extirpated or at high risk of extinction in the Napa River basin. The Napa River watershed is now disturbed in a large percentage of its watershed area by a number of factors including urbanization, timber harvest, vineyard operation, dams for municipal water supply and ditching and diking of stream channels. There are no intact patches of watershed or stream to serve as habitat islands or refugia for Pacific salmon species (Bradbury et al. 1995) and unless some are established salmonid recovery will prove elusive. The following is a recap of species status and summary of factors that caused their decline or demise and that are not sufficiently addressed in the Napa TMDL to allow recovery.

Coho salmon (Oncorhynchus kisutch) were part of the fish community historically and USFWS (1969) estimated the past population at 2000-4000 adults. This species has been extirpated in the Napa River watershed likely due to reservoir construction for municipal water supply on east-side tributaries. As pointed out in my previous comments (Higgins 2006a), their range would have included alluvial valley reaches of the mainstem and tributaries prior to European colonization, but today these reaches are dry or warm and stagnant and wholly unsuitable for coho or even steelhead trout juvenile rearing. Coho were also early fall spawners and would have trouble getting adequate flows for passage, were the population at all functional at present.

Chinook salmon (Oncorhynchus tshawytscha) were thought to have been lost from the Napa River (Stillwater and Dietrich, 2002), but 100 or more spawning in the mainstem in some recent years (Stillwater 2006). The encouraging return of adult Chinook may not translate into an increasing population, however, due to the many ecological bottlenecks present in the Napa River. For example, the mainstem Napa River and larger tributaries have problems with bedload movement due to increased shear stress and channel confinement which likely causes redd scour or fill that decreases egg and alevin survival. Band (2008) and Gearhart (2008) point out that decreases in flow during the first rain events of fall and winter resulting from cumulative effects of operation of hundreds of impoundments and diversions can strand Chinook adults or prevent them from reaching spawning areas. Excessive fine sediment supply from roads and bank erosion is also likely to continue (see below) resulting in problems for successful egg incubation. Flow reduction during winter and spring for frost protection could strand Chinook salmon juveniles (Jackson 2009) even during their relatively short period of freshwater residence.

Steelhead trout (Oncorhynchus mykiss) require one to two years of residence in freshwater and the most substantial ecological bottleneck to population recovery is lack of viable winter and summer juvenile habitat. Flashy stream flow peaks during winter due to human alterations of watershed conditions tend to dislodge juvenile steelhead and prematurely flush them to the ocean before they are of an appropriate size to survive. Narrow, simplified channels have little habitat complexity such as connected wetlands, side channels and large woody debris that would provide shelter during high flows. The map from Stillwater and Dietrich (2002) used in previous comments is displayed again here as Figure 1 because it shows that there is virtually no viable summer habitat for steelhead juvenile rearing.

Barnhart (1986) points out that northern California steelhead that successfully reach adulthood are generally 2 years old when entering the ocean and from 18.6 to 21 cm (5.6" - 8.4") in length. There is currently virtually no viable habitat capable supporting older age steelhead at present in the Napa River basin. Anderson (1969) noted that the mainstem historically provided habitat for larger older age juveniles, while smaller juveniles resided in smaller tributaries. In summer, only Redwood Creek maintains continuous flow over long reaches and the mainstem Napa River now drops to 1 cubic foot per second at the USGS gauge, far too little to maintain cool water temperatures and to provide viable habitat for juvenile steelhead rearing (Figure 2 & 3). Stillwater and Dietrich (2002) noted that steelhead juveniles stranded in isolated pools in Redwood Creek lost weight during summer due to lack of insect drift delivered not being delivered by flows. Therefore, neither the mainstem nor tributaries provide habitat capable of supporting two year old steelhead that would attain the size needed for ocean survival.

Steelhead adults may experience problems with passage similar to those described above for Chinook salmon due to low flows in winter associated with diversion of surface and groundwater. Increased bed scour and fill associated with increased peak flows would negatively effect steelhead egg and alevin survival in Napa River mainstem, and tributaries such as Carneros Creek (SFEI 2007).

TMDL claims that the status of steelhead is unknown and that more data need to be collected, but available water quality and aquatic habitat data (Figure 1) clearly demonstrate that steelhead have no viable population centers and without prompt action will likely be extirpated. Also, Stillwater and Dietrich (2002) indicated that the current run of adult steelhead is less than 200

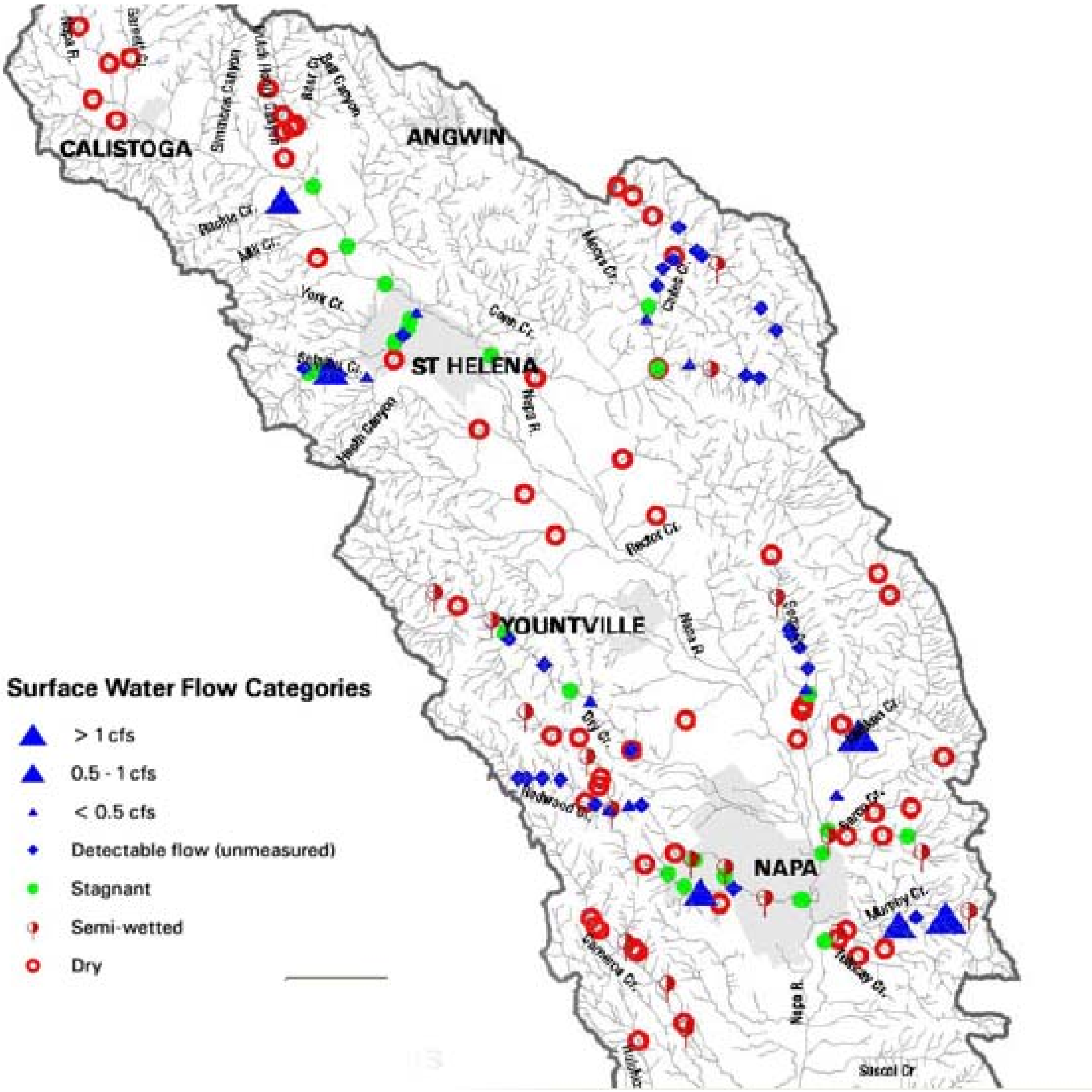

Figure 1. Map of Napa Rive based Stillwater and Dietrich (2002) field survey shows that alluvial valley reaches of Napa River tributaries were dry or had so little flow that they are warm, stagnant and unsuitable for steelhead juvenile rearing.

adults, which indicates high risk of loss of genetic diversity and potential for inbreeding depression that can make extirpation more rapid (Gilpin and Soule 1990). The extreme fragmentation of steelhead distribution and viable habitat is likely resulting in the Napa River population approaching an "extinction vortex" similar to that described by NMFS (2008) for Russian River coho salmon:

> "Based on its decline in abundance, restricted and fragmented distribution, and lack of genetic diversity, the Russian River population of coho salmon is likely in an extinction vortex, where the population has been reduced to a point where demographic instability and inbreeding lead to further declines in numbers, which in turn, feedback into further declines towards extinction."

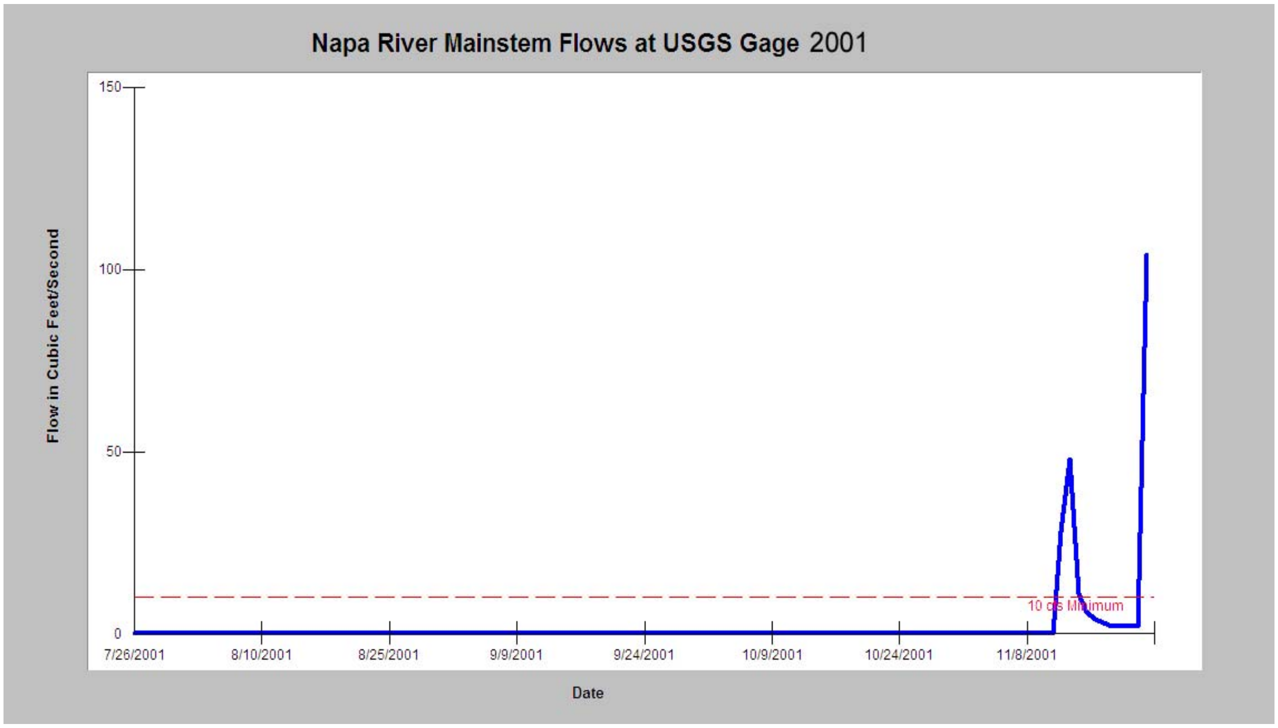

Figure 2. Flow at the USGS Napa River gauge near upstream of Napa show the loss of surface flow throughout the summer and fall of 2001. Data from the CA Data Exchange Center.

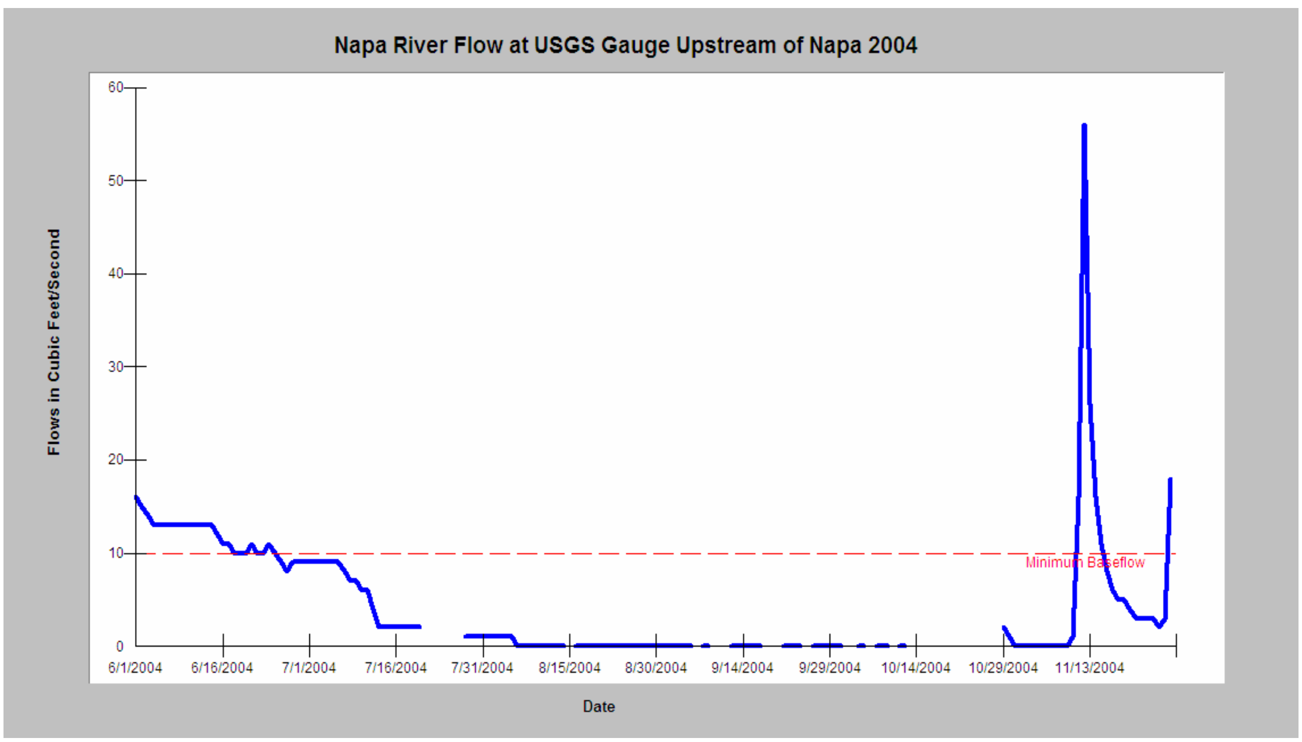

Figure 3. Flow at the USGS Napa River gauge near upstream of Napa shows the loss of surface flow from August through October. Data from the CA Data Exchange Center.

Data from nearby Maacama Creek (IFR 2003) on steelhead standing crops in spring and fall from 1993 to 2001 show problems with survival of juveniles that have increased in recent years and are indicative of water supply problems similar to the Napa River (see below).

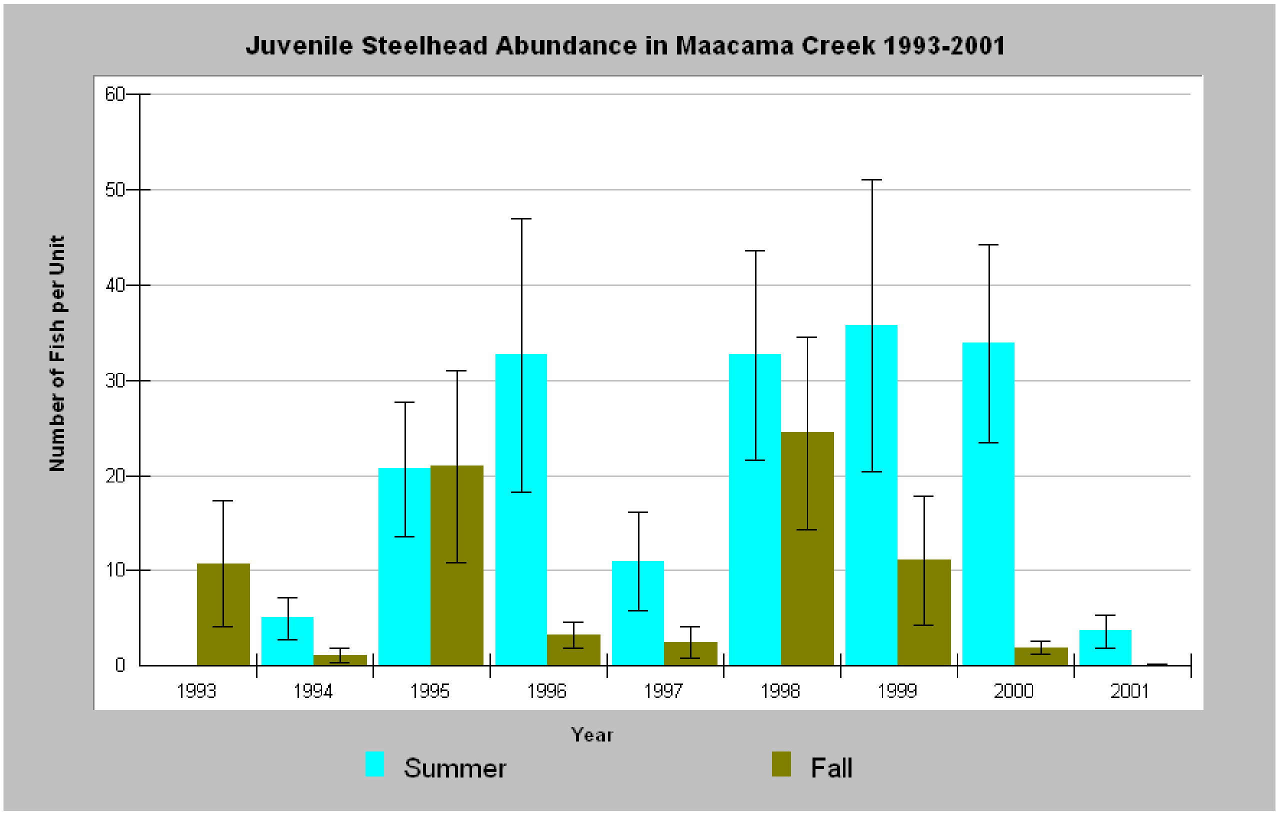

Figure 4. CDFG Maacama Creek electrofishing samples from 1993-2001 show summer and fall steelhead standing crops with substantial drops in all except the wettest years indicating poor survival due to reduction in carrying capacity due to flow depletion. From KRIS Russian River (IFR 2003).

Maacama Creek summer carrying capacity for steelhead is much greater in wet years, such as 1995, 1996, 1998 and 1999, but survival is variable and appears to be declining. The flow data from the mainstem Napa River (Figure 2 & 3) shows that the stream goes dry or nearly so and Stillwater and Dietrich (2002) found that similar conditions prevail in alluvial reaches of tributary channels that would have historically served as rearing habitat for yearling and older steelhead juveniles. Therefore, standing crops of steelhead juveniles in spring would be much higher before the irrigation season than afterward in fall, very similar to those displayed above for Maacama Creek.

Sediment Problems Not Likely to Be Remediated by TMDL

Steps recommended for sediment abatement in the final Napa TMDL are insufficient and lack of their effectiveness will likely confound recovery of Pacific salmon species. Four areas of deficiency with regard to this issue are addressed below: 1) sediment from roads, 2) sediment generated by downcutting due to increased peak flows and channel confinement, 3) interactions of agricultural diversions and changes in sediment deposition effecting salmonids and 4) continuing sediment pollution from areas upstream of dams that are exempted from the Napa TMDL.

<u>Sediment and Roads</u>: I provided evidence in previous comments (Higgins 2006a) from Klein (2003) that shows a linear relationship between turbidity and road density. The lack of provision by the TMDL of specific road density information, failure to limit or prevent new road

construction and lack of phased decommissioning of existing roads means that the Napa TMDL is not serious about remediation of the sediment problem. It also signifies that the TMDL is not using “best science” as required by the California Environmental Quality Act (CEQA) and is also failing to properly analyze and remedy cumulative watershed effects, which include increased peak flows from roads (Jones and Grant 1996) that are discussed further below.

Experts were convened as a Science Advice and Review Group (SARG) to discuss sediment processes in the Napa River basin as part of the Napa Agricultural Waivers Project (SFEI 2007). SFEI (2007) provides an estimate of 1400 miles of road in the Napa River basin, not including those associated with vineyard operation. With a watershed area of 422 square miles, one can derive a road density of approximately 3.3 miles of road per square mile of watershed (mi./mi.^{2}). The National Marine Fisheries Service (1995, 1996) required that the U.S. Forest Service limit road densities in the Columbia River Basin below 2.5 mi./mi.^{2} and sets that level for properly functioning watershed condition for Pacific salmon if there are few or no streamside roads. If Napa River watershed vineyard roads and abandoned or temporary roads associated with timber harvest were added to the total, it would likely be over 4 mi./mi.^{2} with urbanizing some sub-basins likely much higher. According to Klein’s (2003) regression, this would likely cause 25-35% exceedance of turbidity over 25 ntu, which is a level known to inhibit steelhead juvenile growth (Sigler et al. 1985, Klein et al. 2008). The Napa TMDL denies that there are pervasive turbidity problems in the Napa River but has failed to collect data to substantiate this position through installation of continuous data recorders (see Monitoring). Without reduction of road densities and removal of stream side roads (Harr and Nichols 1993), chronic surface erosion and pulses of coarse sediment from episodic landslides triggered by roads will continue to pollute the Napa River.

<u>Downcutting Will Continue to Produce Sediment Under TMDL</u>: The Napa River channel (Figure 5) and those of tributaries like Carneros Creek (Figure 6) are confined by dikes or levees and straightened. The Napa TMDL (Napolitano et al. 2009) recognizes problems with increased shear stress in confined channels that causes sediment pollution from bed and bank erosion and is implementing appropriate action in the Rutherford reach of the mainstem Napa River. However, there is no mechanism described in the TMDL to insure timely re-connection in other reaches to adequately restore biological and hydrologic functions. As indicated by Jackson (2009) and Curry (2009), the Napa TMDL is also not adequately dealing with peak flows; therefore, downcutting and bank erosion will likely continue. SARG members estimated that the Napa River was downcutting 4-6 feet per decade and that sediment yield from this source is likely greater than from roads (SFEI 2007). Solutions to hydrologic cumulative effects problems are discussed below.

<u>Altered Sediment Processes Due to Cumulative Effects of Agricultural Impoundments</u>: SFBRWQCB staff did not adequately address the question (Higgins 2008a) of changes in sediment transport brought about by cumulative effects of multiple diversions and legal and illegal impoundments. Band (2008) notes that Chinook salmon or steelhead adults migration is limited by reduced flows from filling of hundreds of impoundments and fines sediment coming with the first storms would also travel a limited distance because of reduced flows. He postulates that fish would typically be congregated at points of convergence of tributaries where stream profiles widen and, therefore, deposition of fines will occur in spawning areas. The Carneros Creek watershed has vineyard development in over 50% of its area and dozens of impoundments resulting in significant sediment pollution as described by Pearce and Grossinger (2005):

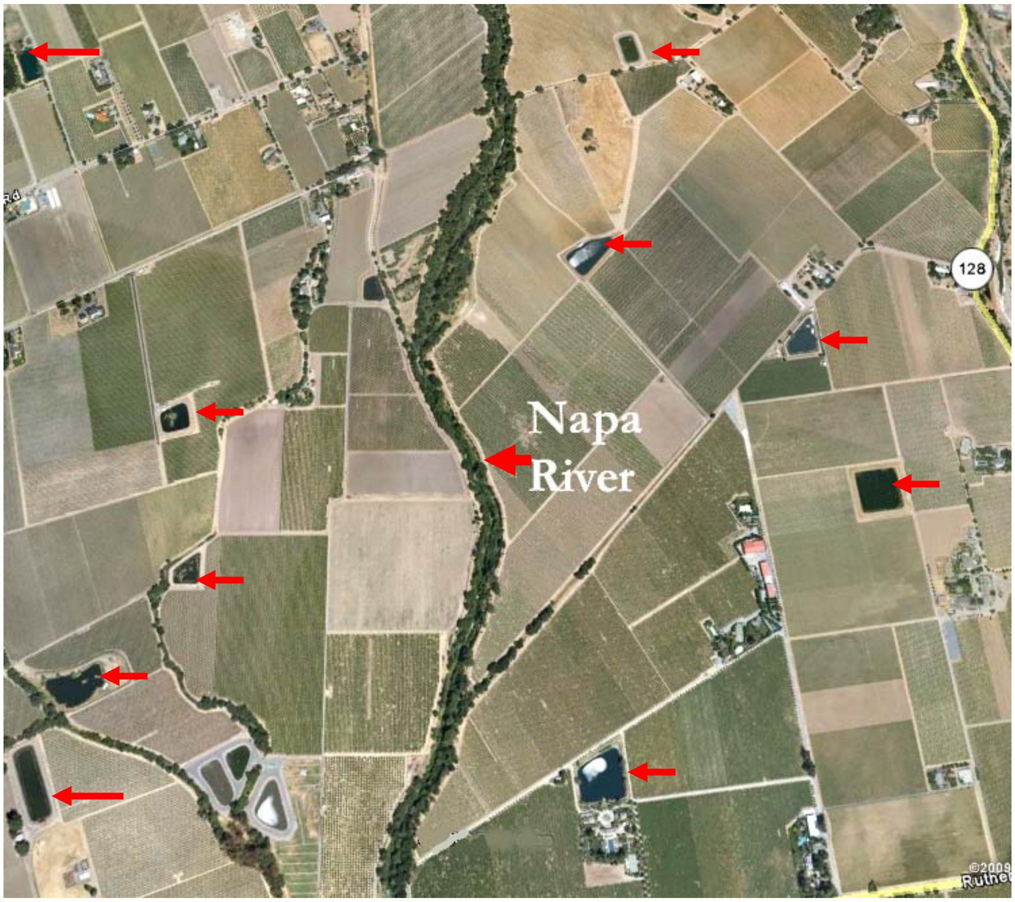

Figure 5. Napa River channelized and disconnected from its flood plain above Rutherford Rd. Note numerous impoundments (red arrows) and very narrow riparian zone. From Google Earth.

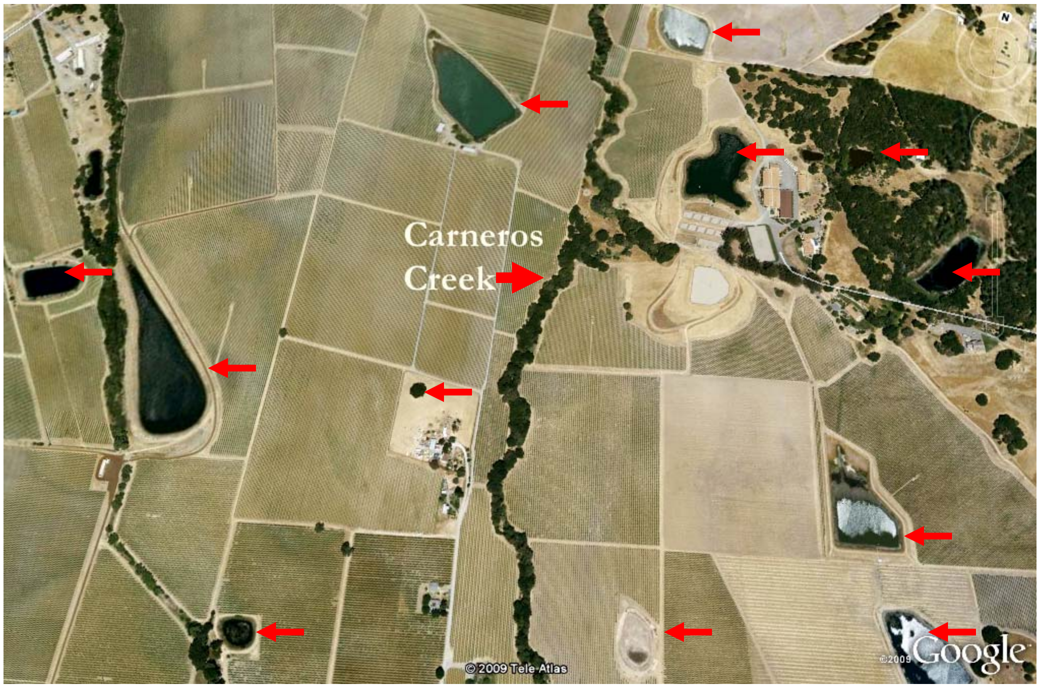

Figure 6. Carneros Creek with channel and riparian conditions similar to the mainstem Napa River. Note that a large number of impoundments (red arrows). From Google Earth.

> "Sediment storage occurs as active channel deposits (annually mobile sediment in riffles, glides and runs) in the upper middle reaches, large bars in the lower-middle reaches, and pool deposits in the lowest reaches, with volumes ranging from 0.5 to 3.2 m^3/m of channel. Shear stress analyses suggest the lowest reaches have a very low threshold shear stress, indicating that the stored volumes of fine sediment in the long, slow-velocity pools can be easily re-entrained."
>
> - Pearce and Grossinger (2005)

A major contributor to sediment over-supply is likely bank erosion due to channel confinement and increased peak flows that promote downcutting of the stream. Both altered vineyard drainage and agricultural impoundments may periodically contribute to elevated peak flows, as the latter may act as an equivalent to total impervious area when reservoirs are full (Jackson 2009). The disconnection of the stream channel from the flood plain in confined reaches (Figure 6) leaves no storage compartments for sediment. Consequently, pools in lower Carneros Creek that should be spawning and rearing habitat for steelhead are buried.

<u>Steelhead and Sediment Above Dams</u>: The final Napa TMDL (Napolitano et al. 2009) does not cover areas upstream of five municipal dams. In earlier comments (Higgins 2006a, Jackson 2006) we raised the issue of finer sediment particles (<1 mm) from tributaries passing through reservoirs and impacting downstream reaches accessed by anadromous salmonids. Although the SFBRWQCB staff has responded, they have not shown that sediment pollution in downstream reaches will not occur:

> "Because all municipal reservoirs are very large, essentially all sand discharged into them is deposited therein. Therefore, sand delivery to channels from land areas located upstream of the municipal reservoirs does not exert a measurable effect on the sand concentration in channel reaches downstream of these dams, and hence does not influence sand concentration in the Napa River or tributary reaches that provide potential habitat for anadromous salmonids."
>
> - Napolitano et al. 2009

Particles less than 1 mm that can remain suspended are known to infiltrate redd pockets and smother salmonid eggs (McNeil and Ahnell 1964, McHenry et al. 1994). Additionally, problems with increased flood peaks due to hydrologic alteration of the landscape also occur upstream of reservoirs and can contribute to lower Napa River flood peaks once reservoirs are filled to capacity (Jackson 2009). For these reasons, the exclusion of areas upstream of dams in the Napa TMDL is capricious because of clear cumulative effects linkages to downstream pollution.

SFBRWQCB staff (Napolitano et al. 2009) also allege that "because all five municipal dams are complete barriers to steelhead and salmon migration, absent dam removal, there is no potential habitat for anadromous salmonids upstream of these dams." As explained in previous comments (Higgins 2006a), steelhead have the capacity to adapt and manifest a resident trout life history when migration routes are blocked. There is substantial evidence that land-locked steelhead are using reservoirs to grow to adulthood and then spawning in reservoir tributaries (Leidy et al. 2003). Given the lack of refugia and population centers for steelhead in the lower Napa River basin, these somewhat isolated populations should get special protection under the Napa TMDL in case gene resources are needed for restoration. This is especially true given the reduced steelhead population below the dam having fallen to levels known to potentially compromise genetic diversity and long term population viability (Gilpin and Soule 1991).

Deficiency of SFBRWQCB Staff Response to Previous Comments: Response to comments regarding sediment abatement by SFBRWQCB staff are largely rhetorical and not scientifically valid:

- To avoid and minimize potential adverse impacts of compliance actions, we have added mitigation measures including performance standards for vineyard stormwater runoff quantity.
- Please note instead that all significant upslope categories of sediment delivery to the Napa River ….. will be regulated by waste discharge requirements and/or conditional waivers.
- No recommendations/guidelines are needed to limit development or reduce impacts of roads. Please note that sediment allocations by their nature place a cap on total discharge.

Napolitano et al. (2009)

All these "solutions" ignore the fact that once cumulative effects thresholds are exceeded, damage to channels and aquatic habitat cannot be abated through on-site or even watershed-wide mitigations (Ligon et al. 1999, Dunne et al. 2001, Collison et al. 2003).

Chinook Salmon and Steelhead Recovery Cannot Be Achieved Without Restoration of Watershed Processes and More Active Protection

Aquatic habitat simplification associated with cumulative watershed effects disturbance is recognized as causing diminished species diversity (Reeves et al. 1993) and that is the case with the Napa River. Bradbury et al. (1995) point out that "protection can be effective in the absence of restoration, but restoration cannot be effective without protection." The TMDL does not include effective habitat protection measures and instead falls back on other authorities that have previously failed to prevent water pollution or protect and restore flows (Higgins 2008).

Historic Napa River Aquatic Habitat Cycles and Pacific Salmon Metapopulation Function: Salmon and steelhead thrived in the Napa River for tens of thousands of years despite a constantly changing freshwater ecosystem due to patterns of landscape disturbance related to fire, floods, droughts, volcanic eruptions, and other natural events. Disturbance would tend to occur in patches at a sub-basin scale leaving only a portion of the river system impacted at any given time (Reeves et al. 1995). Cataclysmic historic events such as volcanic eruptions might have caused all Napa River salmon and steelhead populations to stray into adjacent intact San Francisco Bay watersheds that retained healthy aquatic habitats. Once the Napa River channel was flushed sediment and habitat became suitable, the salmon and steelhead from intact basins would provide a source of colonists in what is recognized as metapopulation function (Rieman et al. 1993). Today many San Francisco Bay tributaries have very limited habitat and salmon and steelhead populations (Leidy et al. 2003). Therefore, there is no source of colonists to re-start the Napa River steelhead population in the event that the local population is lost.

Current Conditions Equate to "Press Disturbance" That Does Not Allow Salmonid Recovery: For example, steelhead only persist during summer in isolated headwaters where connectivity is often lost due to dewatering of upstream and downstream reaches (Higgins 2007). The pattern of land and water use does not mimic the natural "patch" disturbance regime that would have prevailed before European colonization. Such widespread development and land use is termed by scientists as a “press disturbance” (Reeves et al. 1995) where the timing and amount of sediment, large wood and water contributed to the Napa River have no resemblance to historic norms with which Pacific salmon co-evolved and; therefore, these animals cannot survive.

<u>Lack of Limits to Disturbance Confound Abatement of Sediment Pollution and Salmonid Recovery</u>: Cumulative watershed effects lead to channel changes over and above what would be predicted by each development action alone (Collison et al. 2003) and mitigations on a project by project basis do not work when disturbance passes a certain scale (Dunne et al. 2001). Reeves et al. (1993) found that aquatic habitat remained diverse and Pacific salmon communities were maintained when 25% of a watershed or less was logged in a 30 year period. More than 60% of the Napa River watershed is in active land use (Winter 2000) and many of the human activities are far more damaging than timber harvests. Approximately 7% of the watershed is paved or in total impervious area (Homer et al. 2004), which is known to cause the greatest changes in peak flows and is also associated with toxic runoff (Booth and Jackson 1997). The 38% of the land currently in grazing may contribute to elevated peak flow depending on the amount of soil compaction related to range management (Gifford and Hawkins 1978), but hydrologic alteration related to vineyards that cover 14% of the landscape are much greater (Figure 7). Tile drains under vineyards cause water to be shed from the landscape instead of percolating into the groundwater table and surface and groundwater extraction associated with their operation is drying up alluvial valley reaches of the mainstem Napa River and its tributaries. Changing sediment yield and flows to conform more closely to historic conditions and those required under the Clean Water Act cannot be achieved with increasing watershed disturbance with on-site mitigation.

<u>Illegal Impoundments Must be Removed</u>: There are over 1,000 agricultural ponds in the Napa River basin (Napolitano et al. 2009) and many do not have appropriate water right permits (Higgins 2008a, 2008b). Band (2008) points out that the: “cumulative impacts of water diversions from all areas of a drainage network require consideration of the network as an entity, and not just the sum of all individual reaches.” The SFBRWQCB staff did not respond substantively to our previous request (Higgins 2008a) to consider cumulative effects from multiple legal and illegal diversions. Therefore, the TMDL does not comply with CEQA requirements and many problems for salmonid species associated with operation of 1000 agricultural impoundments will remain unaddressed (Higgins 2008). When full, impoundments also increase peak flows because they act as total impervious area (Jackson 2009). Cumulative effects problems cannot be remedied without removing hundreds of unpermitted impoundments and putting an enforceable policy for operation in place for those that remain.

<u>Groundwater Extraction Needs to be Controlled</u>: Extraction of groundwater that is directly connected to surface water requires an appropriative water right and USGS (Frye 1973) pointed out that the lower Napa River valley aquifer is shallow and has such connections. Over-use of groundwater must be curtailed to prevent continued dewatering of Chinook salmon and steelhead habitat in alluvial valley floor reaches of the mainstem and key tributaries. Jackson (2009) showed that the mainstem Napa River has gone from a “gaining” stream, with groundwater contributions adding to the flow in a downstream direction, to one that is flow limited due to quadrupling of groundwater extraction since 1973 (Frye 1973). This results in a habitat bottleneck for older age juvenile steelhead that must find larger order streams to rear and grow to sufficient size to optimize chances for ocean survival. The science on this subject is very clear and water quality and beneficial uses of the Napa River cannot be restored unless excessive groundwater use is stopped.

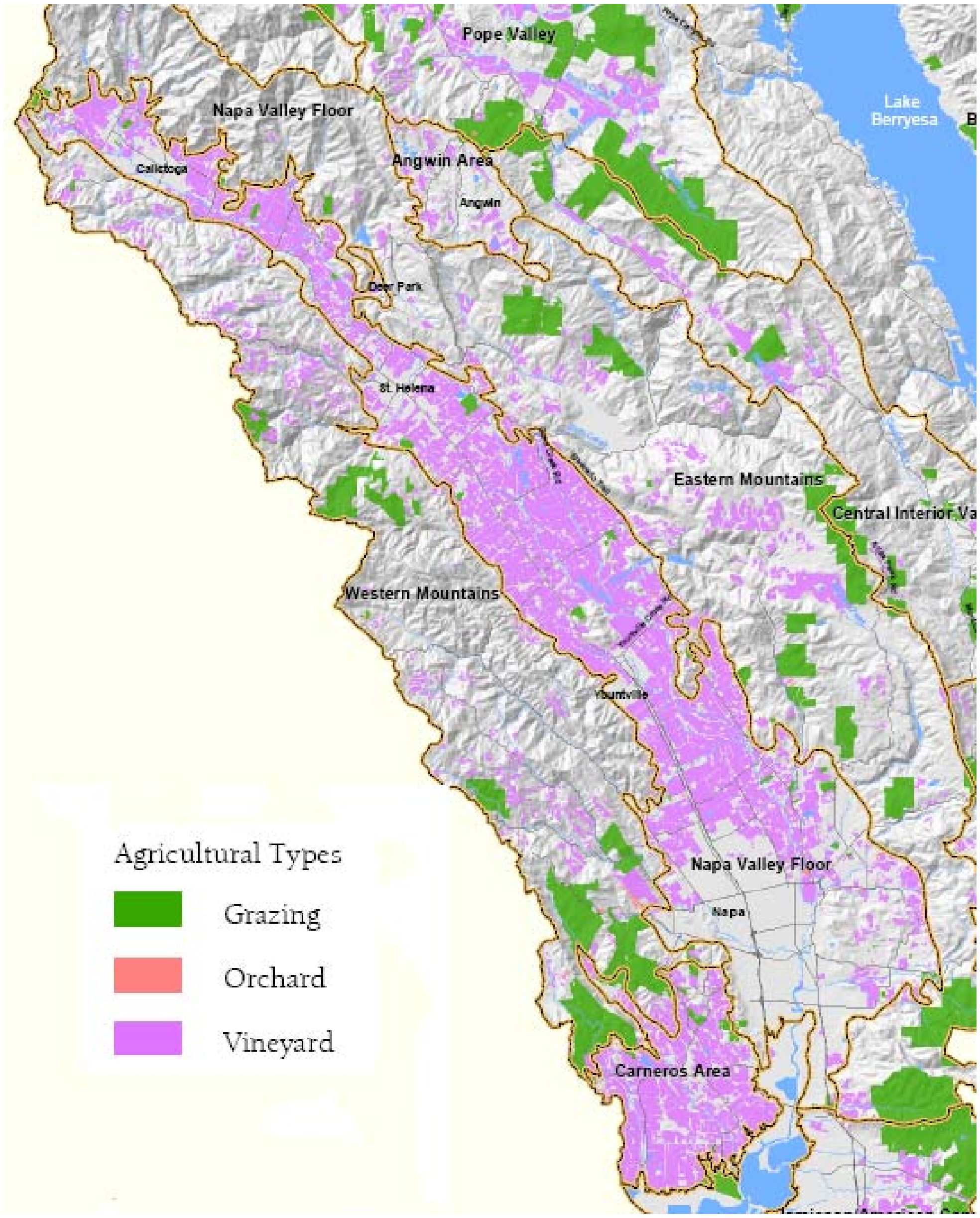

Figure 7. Land use map from the Napa Baseline Data (BDR) report and shows that virtually the entire Napa Valley floor is now in vineyards and areas like the Carneros Creek sub-basin appear to have more than half the watershed in land use of this type.

<u>Failure of State and Federal Agencies to Protect Pacific Salmon Species and Habitat:</u> The Napa TMDL invokes the authority of other agencies as an important part of the remediation of pollution when in fact it is the failure of these same State, federal and local agencies that has caused the need for the TMDL.

State Water Resources Control Board Water Rights Division: The SFBRWQCB staff invoke Waste Discharge Requirement (WDR) permits or group waivers as a method to insure that flows are restored:

> "Please note that as a condition of the WDR waivers, staff will propose that the Water Board require compliance with all water rights laws in order to obtain coverage."

The SWRCB WRD has shown no ability or inclination to enforce California Water Codes or to regulate use of groundwater in the Napa River (Higgins 2008a, 2008b); therefore, the SFBRWQCB action is insufficient and will likely be unsuccessful. The specific statutes in the California Water Codes that are failing to be enforced are:

§ 1052: No dams will be constructed without a permit
§ 1243: Sufficient water for remains for "recreation and the preservation and enhancement of fish and wildlife resources
§ 1375: Must establish surplus water exists before issuing new Appropriative Rights permits

The California legislature passed AB 2121 in 2004 in hopes of getting flows back in northern California Rivers and yet the SWRCB WRD has not taken action to remediate problems. Numerous reviewers of their *Draft Policy for Maintaining Instream Flows in Northern California Coastal Streams* noted that the agency will not be able to take action until they have collected field data on flow throughout the region (Band 2008, Gearhart 2008, Lang 2008). As part of the study, Stetson Engineers (2007) mapped and enumerated permitted and unpermitted agricultural impoundments in the California North Coast region, including the Napa River (Figure 8). The cumulative effects of operation of all these legal and illegal agricultural reservoirs is having a profound impact on salmonids in the Napa River and adjacent basins like Maacama Creek (Higgins 2009) and problems will not be remedied unless the SFRWQCB takes direct action.

California Department of Fish and Game: Fish and Game Code § 5937 states that streamflow must be maintained, but CDFG fails to enforce this provision. After losing the battle to maintain stream flow below municipal reservoirs (Anderson 1969), it would seem that CDFG has given up on maintaining flow in the Napa River and there is no expectation it will invoke its authority to remediate continuing loss of streamflow and fish habitat.

County of Napa: The Napa TMDL states that "For reasonably foreseeable projects that may adversely effect special-status species, all are subject to discretionary approval by Napa County" and that when projects overlap with the habitat of such species that the county requires a "biological resources evaluation and avoidance of impacts to the extent feasible." Napa County has a goal to "prevent degradation of intact (i.e. unimpaired) waterbodies throughout the county" (Hoenicke and Hayworth 2005), but no functional aquatic habitat patches that support salmonids in the Napa River watershed have been protected. The reason is that mitigation measures imposed for each project are being overwhelmed due to cumulative watershed effects.

<u>SFBRWQCB Needs to Exercise Authority to Improve Flows</u>: The SWRCB WRD has failed to take any action on illegal impoundments and/or to regulate use of groundwater connected to surface water that are both leading to critical Napa River flow depletion (Higgins 2008). Consequently, U.S. Supreme Court (1994) precedent authorizes the SFBRWQCB to act to exert authority and take measures to increase flows because there is no other remedy to remediate pollution and restore beneficial uses.

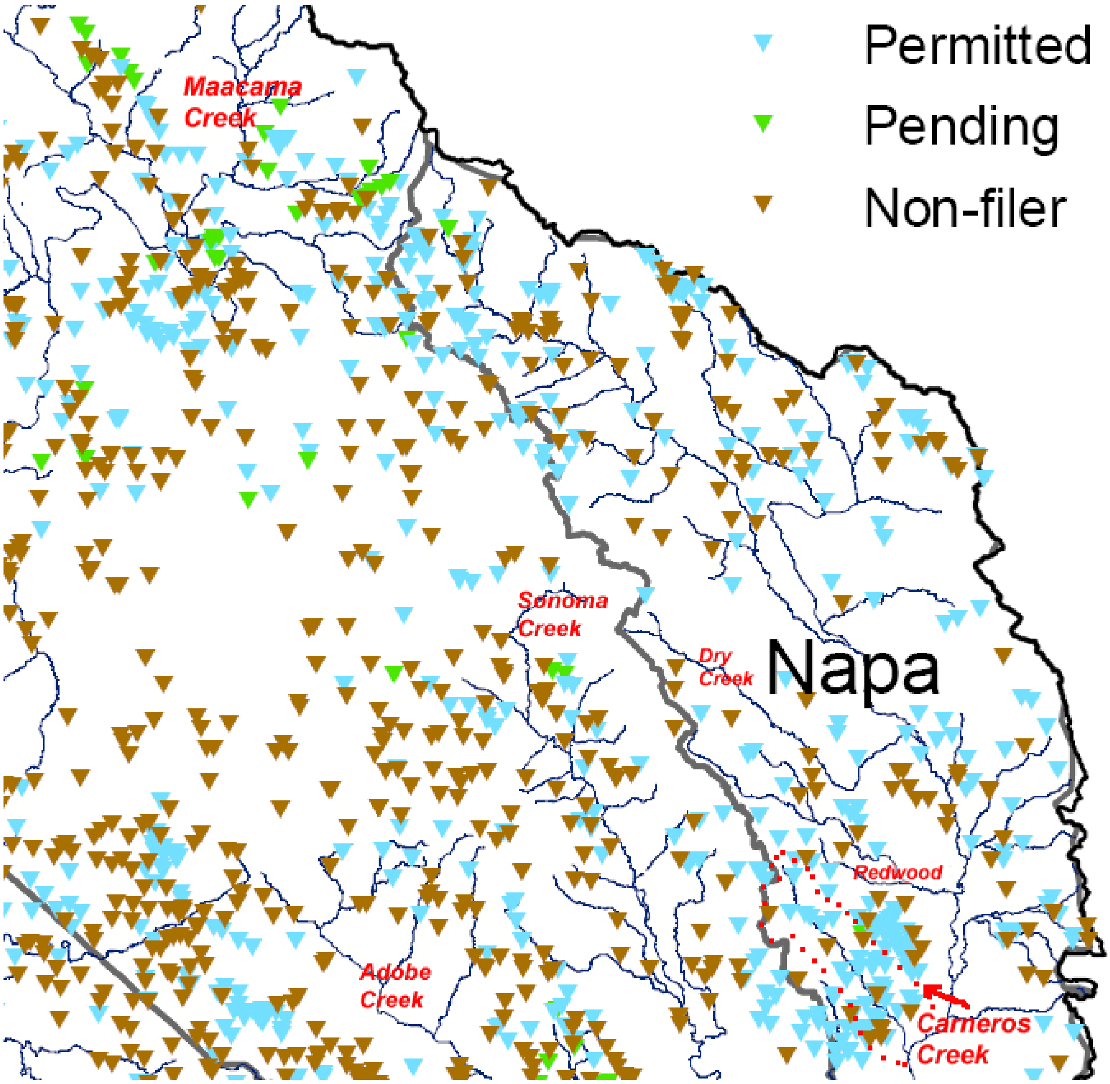

Figure 8. Map of permitted and unpermitted impoundments in the Napa River watershed and in adjacent basins to the west in Sonoma County. Taken from Stetson Engineers (2007).

Scale and Location of Refugia for Real Chinook Salmon and Steelhead Restoration

The best candidates for protection and restoration according to the Bradbury et al. (1995) method would be Redwood Creek, Dry Creek and Soda Creek on the west side of the Napa River basin, based on flow and habitat condition data collected by Stillwater and Dietrich (2002). Watersheds with high quality aquatic habitat are generally more intact and have lesser levels of human disturbance (Bradbury et al. 1995). If steelhead are to be restored in one or all of these sub-basins, then

- Vineyard conversion would cease and at least some in floodplains would be acquired for retirement,
- Timber harvest could only be done to improve forest health, such as thinning from below and using very low ground disturbance methods,
- Road densities would be strategically reduced and segments decommissioned or relocated to decrease streams side roads, road-stream crossings and roads on unstable slopes,

- No new road construction would be allowed unless offset by a greater amount of road decommissioning,
- New residential development would include maximum of water conservation measures, including systems of cisterns to catch rainwater,
- Any residential development would also minimize TIA,
- Illegal or unpermitted water impoundments in these sub-basins would be removed within five years, and
- Groundwater and surface water monitoring systems should be installed that control irrigation based on soil moisture and shut off supply when water levels in streams and wells reach a point defined as necessary to maintain fish and beneficial uses.

Reconnection of mainstem Napa River reaches to the floodplain is also needed to protect and restore Chinook salmon as well as to create older age steelhead rearing habitat. While the current Rutherford reach channel restoration project is a step in the right direction, an appropriate change in land use would require something on the order of half that mainstem channel on the Napa River valley floor to be reconnected. The TMDL acknowledges that downcutting of the stream channel cannot be abated without such action and additional benefits include recreation of sediment storage areas on terraces that would reduce sediment in the active channel. Connection to the floodplain reduces bed shear stress but could also help with attenuation of flood peaks that currently threaten downtown Napa. In Maine Atlantic salmon recovery efforts (NMFS and USFWS 2004), riparian easements sometimes extend for the entire length of the riparian zone in some watersheds and restoration on the mainstem will have to be scaled up if it is to succeed.

A major water temperature buffer mechanism in mainstem river environments is the connection between surface water and groundwater that is fostered by side channels or river meanders (ODEQ 2008). In order to recreate these connections, mainstem Napa River easements need to be 100-300 feet wide so that natural meander patterns can be re-established. Retiring near stream land use will help reduce sediment and easements could also help with retiring some water rights or use, such as near stream wells that currently cause a drop in groundwater levels and decreased cold water contributions to the mainstem. Equal consideration might be given to restoring alluvial valley reaches of any Westside tributaries chosen as refugia. Unless these reaches with very high intrinsic habitat potential are restored, restoration of salmon and steelhead in the Napa River basin will not likely succeed (Williams et al. 2008).

TMDL Monitoring Uses the Wrong Tools and Has No Identified Funding

Effectiveness monitoring under the TMDL relies most heavily on gravel permeability and streambed scour as indicators and these two parameters are the only ones for which targets are set. Instead the TMDL should have selected from recognized scientific tools that are more cost effective in diagnosing sediment problems and have been widely field tested (Barnard 1992, Knopp 1993, Klein 2003, Klein et al. 2008).

As noted before, permeability can be highly variable and is still somewhat experimental in its application in northwestern California (McBain and Trush, 2000). In recognition of this problem, the TMDL calls for permeability measurements at over 200 sites. Bulk gravel samples are a more recognized standard (McNeil and Ahnell 1964, Kondolf 2000) and targets for fine sediment (<0.85 mm) and sand size particles (<6.4 mm) have been set by the North Coast Regional Water Quality Control Board (NCRWQCB 2001) and accepted by the U.S. Environmental Protection

Agency (1998, 1999, 2000). Use of more standard bulk gravel samples would be comparable in cost, yield more reliable and meaningful results and would allow regional comparisons.

In response to previous comments (Higgins 2006a), the Napa TMDL has now states that turbidity and residual pool volume measurements should be taken in reaches monitored for permeability and bed scour. Klein (2003) demonstrated that turbidity shows immediate response to land management and it is an equally good tool for tracking response to implementation of erosion control measures. Similar to bulk gravel samples, the relationship of turbidity and negative effects on fish are well studied (Klein et al. 2008), which is another factor that argues in favor of its widespread use as a monitoring tool of choice. Grab samples for turbidity would not be useful and continuous recording turbidity devices should be deployed on the mainstem Napa River at least three location and above points of convergence with major tributaries such as Carneros, Redwood, Dry and Sulphur Creeks as well as below Eastside municipal reservoirs to determine different response to management at present and to track recovery of water quality over time as restoration measures are implemented.

The vague reference to measurement of trends in residual pool volume does not meet my concern for more widespread use of valid scientific techniques. Instead the Napa TMDL should have referenced Hilton and Lisle's (1993) V-Star (V*) method of measuring the volume of sediment in pools relative to the total volume of sediment and water. This should be used in response reaches (Montgomery and Buffington 1993) of all major Westside Napa River tributaries because of its cost-efficiency. A trained crew can measure ten pools in a day, which is a statistically valid sample (Knopp 1993) so trend monitoring could be accomplished with a two or three person crew in less than two weeks a year. Land use relationships to V* values have been tested and targets adopted for the region (NCRWQCB 2001, U.S. EPA 1998, 1999, 2000).

In response to comments, Napolitano et al (2009) stated: "We also are open to receiving additional input regarding analytical approaches that could be used to determine whether well pumping affects streamflow." What is needed is an interconnected system that monitors soil moisture, stream flow and groundwater levels capable of regulating use when the Napa River reaches critically low levels. This type of technology is not only readily available but could be installed in relatively short period of time. One purveyor of such systems is Groundswell Technologies, Inc and Dr. Mark Kram (Personal Communication) would be interested in doing a Napa River pilot project. See: www.groundswelltech.com/Groundswell/Groundswell_Technologies_Products_and_Services___Water_Resources_Management.html

Hoenicke and Hayworth (2005) point out that a "minimum level of locally based long-term and reliable funding is required to maintain a basic trend record and understanding of changes in core watershed health indicators." The TMDL has not identified such funding and without it trend monitoring will not be possible nor will adaptive management. Hoenicke and Hayworth (2005) recommend that monitoring take place as a priority where land owners are cooperative. Instead the TMDL should require monitoring access as part of WDR permits or waivers of WDR.

To meet legal requirements of CEQA, the Napa TMDL and Basin Plan Amendment need to explicitly state that all data collected to gauge the success of implementation will be available in raw form for scientific audit by the public and all regulatory agencies and that such data be made available within six months of collection and be shared on a publicly available website.

Adaptive Management Failure

Hoenicke and Hayworth (2005) explain the use of adaptive management (Walters and Hilborn 1978, Walters and Holling 1990) in the Napa TMDL process as follows:

> "Monitoring information will provide the basis for flexible and most cost-effective implementation for reductions in human-induced pollutant inputs. Monitoring will also allow managers to determine if they have reached their goal or if the goal needs to be adjusted based upon newly collected and more robust information and data about the watershed and how it functions."

The National Research Council (2004) described adaptive management as follows:

> "Adaptive management is a formal, systematic, and rigorous program of learning from the outcomes of management actions, accommodating change, and improving management (Holling, 1978). Its primary purpose is to establish a continuous, iterative process for increasing the probability that a plan for environmental restoration will be successful. In practice, adaptive management uses conceptual and numerical models and the scientific method to develop and

Dr. Carl Walters (1997) has followed 25 case studies of riparian and coastal ecosystem restoration projects around the world that claimed to be practicing adaptive management, but found "only seven of these have resulted in relatively large-scale management experiments, and only two of these experiments would be considered well planned in terms of statistical design." He notes that too little change in anthropogenic stressors is carried out in most cases so that natural variations are not distinguishable from project effects. Actions under the Napa River TMDL fall into the latter category where there is insufficient change in land and water use and too small an area likely to be restored to even be detected in monitoring results. Instead miles of alluvial valley reaches need to be re-connected to the floodplain and hundreds of unpermitted impoundments removed to significantly reduce pollution, restore salmonids and frame an interesting and valid adaptive management exercise.

Another requirement of successful adaptive management is that action is taken to correct restoration program direction, if data suggest current management is not achieving desired outcomes. Regulatory agencies such as the SWRCB WRD have shown no inclination to act even when there is ample evidence of violations of the law and decimation of public trust resources and beneficial uses. The actions needed to protect the last patches of viable habitat and to begin to restore flows are not forthcoming because the SFBRWQCB and other agencies are not willing to get in the way of development or to withstand the political pressure likely to be precipitated by enforcement actions. Instead the agencies will continue to violate the Clean water Act by allowing further vineyard development as described by Winter (2000):

> "Planning officials expect Pope Valley and the hillside areas of American Canyon, Jamison Canyon and the western side of the Napa Valley to be the primary vineyard expansion areas in the future. They anticipate that over 4,000 acres will be planted in the next 10 years, primarily on hillsides, since there is very little acreage left unplanted on the valley floor."

Conclusion

The pervasive Napa TMDL assumption that all potential for sediment yield and damage to aquatic ecosystems can be prevented through mitigation measures and use of best management practices has been demonstrated to be incorrect by numerous northern California studies (Ligon et al. 1999, Dunne et al. 2001, Collision et al. 2003). Consequently, the Napa River TMDL is scientifically flawed, insufficient to meet CEQA requirements and cannot possible attain its goals and objectives. The TMDL also ignores scientific methods for restoration of Pacific salmon (FEMAT 1993, Doppelt et al. 1994, Reeves et al. 1995, NRC 1996, 2004) and is not likely to be successful in improving Chinook salmon and steelhead populations as a result.

The National Research Council (1996) noted that Pacific salmon species could not be recovered without restoration of low gradient habitats in landscapes that are often very developed:

> "Lower river valleys or coastal lowlands and estuaries lack refugia with high quality habitat for salmon, and there seems to be little hope of future establishment of such areas without considerable public resolve and financial commitment."

At present the Napa River TMDL has failed to garner such support.

Sincerely,

Patrick Higgins

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