COMMENT 1

October 15, 2007
Comments on the Groundwater Study Plan
Marcia H. Armstrong, Supervisor 5th District
Siskiyou County

I cannot support the plan as written. Primarily, it should be remembered that this is a voluntary, community-based study, This means that one must acquire permission from the landowner for any bore-hole, well, instrument or scientific field work that you wish to conduct. It should also be recalled that the rivers are non-navigable, requiring landowner permission to access, drill, etc. and study. The County cannot and will not force anyone to give their permission.

A huge component of the study will be community outreach and developing landowner support in order to acquire permission to do these invasive studies that you outline. A lot of this work is to develop participant trust that the results of the studies will not be used to target people in a punitive, regulatory manner. You might also be aware that you will probably not get cooperation on the level that your wells or bore-holes will be at the intervals you want or the river transects or measurements at the points you want. The plan should anticipate that and not be so rigid. Perhaps these could be written as desirable objectives and not tasks.

It also should be kept in mind that, although the TMDL is written for beneficial uses for cold water fisheries, there also is an equally valid beneficial use of agriculture. This use happens to be the one upon which our County and Scott Valley economy is based. Adequate water quantity is necessary for this economy to survive. Otherwise, we will see the unintended consequences of land conversions to ranchettes, which experience in the Shasta Valley has shown has doubled the number of wells. If groundwater managers (the landowners) are going to be able to have the information to make decisions, and if we are to craft workable alternatives, they are going to have to be able to understand the trade-offs of alternate use regimes. You should keep that in mind when designing your proposed study plan and make sure both sides of the trade off are shown.

It should be noted that the TMDL requires writing of the plan – not necessarily implementation. As it is community based, that would be contingent upon receptiveness by the community and potential participants.

Specific Comments

Page 6 line 227 – Do we need a time schedule? Implementation will be dependent on the time it takes to get willing participants and the ability to acquire funding.

Page 7 line 316 – Note that climate change and the effects on future water supply and energy needs for water management are some of the elements that will give proposals brownie points for funding under Prop. 84

Page 8 line 34 – "fluctuations have significantly changed since 1950." Appears to contradict your statement on page 22 line 913-4 where you state "levels have remained fairly constant."

Page 11 line 444 and 447 – Why are we modeling pre-historically? The rivers and landscape no longer have the capacity to perform in that manner. (Dredger tailings, climate, major land use changes, major changes in the rivers.)

Page 5 – line 223 – Please remove the statement regarding "Public Trust values." That has political and involves questions on legal navigable status that the County does not wish to get into in this document.

Page 16 line 654-5 – Is it the intent to ignore the Marble Mountain segment – particularly Quartz Valley? That is what was done in the static level study and I think it is a mistake. These are major coho streams and important contributors to cold water.(Page 30 lines 1219-1227)

Page 23 lines 932-936- Please add Siskiyou County. Jim DePree has contributed a lot and we are paying for this year's static well study.

Page 37- line 1536 - This should be updated to reflect that the Governor signed AB 1580 for local watermaster service on the Scott and Shasta http://leginfo.ca.gov/pub/07-08/bill/asm/ab_1551-1600/ab_1580_bill_20071010_chaptered.html

Page 37 line 1545 – 1551 As I understand it, the USFS is entitled to 200 sec. ft. of flow as a priority one user in that reach. There are 12 water users in their reach and 8 are priority ones. When the priority ones are not getting their water, they can shut off the lower priorities in their reach.

Page 38 line 1559-172 It is my understanding that this is a voluntary plan. The RCD has no enforcement authority.

Page 41 line 1686 – "proper management" is a values biased statement. Management practices should maximize beneficial uses – including agriculture, which is the vital economic use of this resource in the area.

Page 47 line 1921 – Installing 140 observation wells at a frequency of 1 per mile or per half mile. This is a nice objective, but should be couched in those terms. Achievement is largely dependent upon landowner cooperation and permission.

Page 48 line 1974 – Same as above in regard to landowner's part in achieving objectives or tasks.

Page 49 – 1998-2004 in-line flowmeters may be a part of the measurements required under the ITP/ watermaster, otherwise, we have the participation limitation again.

Page 50 -2032-3 It should be kept in mind that selection may be based on choosing from those willing to participate, which may not necessarily be where you optimally would want them.

Page 50 lines 2074-2099 Dependent upon voluntary participation

Page 51 line 2110-2112 Would these affect drinking water wells? There are domestic users on these systems.

Page 52 lines 2146-2156 Dependent upon voluntary participation

Page 55 line 2264-2277 I will not support a plan that proposes well metering.

Page 57 line 2356-7 Dependent upon voluntary participation

Page 58 lines 2397-00 and 2408-10 Dependent upon voluntary participation

Page 59 line 2431 I will not support a plan that proposes well metering – period.

Page 61 line 2511 -2512 As I understand it, the TMDL was NOT based on per-historic parameters but on current altered capacity of the system. I don't see why we should illustrate conditions that will never again exist as some kind of baseline standard.
Page 61 lines 2513-1516 the goal of "sustaining a healthy economy and historic family farms by supporting agricultural land and water use."

Page 61 lines 2530-2540 and page 62 line 2571 scales of the study must be crafted to protect individual landowners from regulation, protect their privacy and property rights and encourage their participation.

Page 66 section beginning with line 2745. It should be stated that the purpose of this is not to enforce or require the landowners to use the BMPs developed. This is a voluntary program driven by incentives (market advantage, aesthetic and other values, grants etc. We could even develop a salmon-friendly niche market.) If these are not going to be voluntary and incentive based, then the County and the potential participants need to know so they can consider this when deciding whether or not to participate.

Page 69-70 costs should include outreach and education. Scale and reporting should consider protection of participants

The County has no funds to implement this and I do not foresee that county revenues and obligations would change in such a manner as to provide funds. It is mentioned that the County could apply for Prop 84 funds. I just returned from the IRWMP conference last week. This is what they said about Prop 84 funds. (You might want to consider this when crafting the plan for competitiveness.)

SB 1002 was the prop 84 appropriation bill for 07-08 and was for planning grants. It was vetoed by the Governor. So there is no appropriations bill for this session unless something comes through the Governor's water meetings.
http://gov.ca.gov/pdf/press/SB%201002%20veto%20message.pdf

They want linkages between multiple areas in coordinated plans. They want to improve flood control, address environmental justice and climate change (mitigate greenhouse gas emissions and anticipate needs on a 20 year planning horizon.) Objectives must be measurable. Water management strategies have to consider the 25 strategies in the California Water Plan Update. They want to serve disadvantaged communities, help in salmon recovery further TMDLs. They want to consider the bigger picture. They want to meet statewide priorities, such as coho recovery.

Planning grants will require a 25% cost share (can be waived) and must have relevance to and be consistent with the North Coast RWMP.

Jennifer Jenkins said there are 6 things they want: (1) restore native salmonid habitat; (2) protect and enhance drinking water quality; (3) adequate water supply with minimum environmental impacts; (4) support statewide water initiatives; (5) Serve environmental justice; (6) have an inclusive framework for intra-regional cooperation. Statewide priorities are TMDLs; steelhead and coho recovery plans; Watershed management initiative chapters; basin plans (water quality control plan for the north coast; public health plans, and local coastal plans.)

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COMMENT 2 (from Regina)

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Comments on the Scott River Groundwater Study Plan

The Klamath Riverkeeper summits the following comments on the Scott River Groundwater study plan. First we apologize for not turning these comments in during the six day comment period, however reviewing the plan and related documents in six days is impossible for most people and most Klamath River residents are not represented by Siskiyou County, which has a know bias against fisheries and regulation. The Klamath Riverkeeper believes there are many assumptions in this document that come directly from Siskiyou County and is not scientifically based. This is disappointing considering the great scientific expertise involved in the Klamath River.

Beyond the non-scientific assumptions present in this document, the Klamath Riverkeeper is disappointed that the study proposes to take up to ten years with no proposed mitigation or moratoriums on groundwater pumping in the interim. Much science exist that the groundwater pumping in the Scott River is directly responsible for many of the tributaries and the mainstem Scott in the Scott Valley going dry every year. This lack of water equals not only a temperature related issue, but threatens endangered and tribal trust species and the public trust as a whole. The importance of the Scott River to the whole Klamath River fishery can not be understated and by proposing business as usual while this study is occurring could put the salmon in the Scott River at great risk.

That said we are very glad that this study is being done and hope that it can use the best science possible and not be muddied by the politics of the Siskiyou County. At this time we wish to incorporate the comments of the Klamath Basin Tribal Water Quality Work group.

Below is a list of our main concerns with this plan, then comments delineated by line numbers.

- Study should consider whether groundwater extraction is violating downstream water rights.
- Study should identify a sustainable amount of groundwater pumping,
- Study should identify the areas which have interconnected ground water and recommend that this whole area is included in adjudications,
- Study should take into account flow needs for salmon in the river and how better groundwater planning and conservation can meet those needs,
- All assumptions in the study should have science behind it. Personal communications should not be taken as fact,
- Study should recommend a moratorium on new groundwater pumping and should recommend sustainable levels of pumping for existing wells,
- Study should take into account that this is a public trust issue that effects the whole state through the salmon fishing economy and not just local ranchers and farmers,
- Effects to riparian vegetation from groundwater pumping should be considered,
- All information gathered for this study and all information relied upon for this study should be made available to the public throughout the process to make sure all available information is used and science is sound,
- Water use and conservation recommendations should be included in this study.
- Study should consider historic groundwater levels as the baseline and not current depleted conditions.

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Below are our comments by line number

102. Ground water inflows are also a primary driver of stream temperatures in the Scott Valley.

123. Much evidence on the effects of ground water withdraws on temperature exist.
Include evidence.

193. This part should include and subterranean streams and rivers.
197. This part should include water efficiency.

This section should also include identifying violations of water rights and feasibility of existing water rights actually being enough to deal with supply, as in stream water rights for the Forest Service are never realized.

255. This part should include surface feed sprinkler irrigation and should look at the different methods of use, such as water saving techniques used by other drought prone areas, such as watering in the morning and night, using higher value, less water intensive crops, ext.

261. This part should include whether water table elevations were historically high enough for planting, and if the deplete water table in these areas are from ground water pumping.

267. Ground water in the Scott Valley is connected to surface water and often really subterranean creeks and river. This is a public trust assess and cannot only be made available to landowners.

277. Tribes and other stakeholder should be included. This process needs to be transparent and not another futile study where only in Valley farmers are included in planning and updates.

298-312 Effects of unregulated ground water diversions and lack of oversight on water withdraw and water rights should be included.

320 Due to the effects of climate change all hypothesis should air on the side of caution.

326. Livestock and private use should also be considered.

335. Because this study could take up to 10 years this assertion should be enough information to declare a moratorium on new wells, water rights and increased pumping until the study is done. Assurance that existing water rights are being followed and not overdrawn\ and that non-water right holders are not using ground water should be key to this process.

361-368 This is why a moratorium on groundwater pumping, oversight on water rights, and estimating use is needed for the life of this study.

369. This claim needs to be supported in document and the amount of drawdown that does affect the river needs to be added.

376. This claim needs to be supported and timing that water savings do affect flow should be disclosed. General unsupported statements on water efficiency should only be used if scientifically

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defensible.

395. No mention of the effects of the loss of natural channel variability and repeated in stream bulldozer use is included in this section

398. This section is confusing and should be explained better.

413. Natural vs. man-made drawdown should be discussed.

421. Use of dangerous and often illegal chemicals in these ditches that the impact to groundwater should be studied.

426. This part should include how groundwater is affected by these activities.

434. This sentence should include historic and current as morphology has been greatly affected by humans.

446. The presence of salmon, due to their life history answers this question.

452. Options to deal with this issue should be explored along with cumulative effects.

756. How irrigation affects these streams conditions is unknown and should be further studied.

945. Long term monitoring data should be made available to the public.

1046. Health of ground water should not be assumed in a groundwater study.

1052. Ground water should be sampled as part of this study to make sure agriculture and septic imputes are not causing similar problems as were found in these samples.

1088. Meters should be used at wells

1105. This study should aim to make sure that a uniformed way of studying groundwater is used and assumptions should be avoided.

1306. Effects of fire suppression and fire fighting not discussed.

1316. Effects of logging on Decomposed granitic soils and major road failures not discussed by important in this area. This is a major input of sediment and is responsible for riparian vegetation being destroyed in many areas.

1363. I have read reports of irrigation use efficiency being much worst. This statement should be backed by science and data

1415. Use of this type of experiment as a management tool should be evaluated.

1432. Irrigation efficiency methods for systems outside the individual farm should also be

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consider. For instance using irrigation line rather then open ditches could save a lot of water.

1465. Irrigated agriculture uses way more water then natural vegetation therefore this statement should be backed by data and science.

1475. If water use outside the Adjudication zone is affecting flows, then this study should recommend that these areas be managed through water rights.

1504. Groundwater should be managed under state law if this study finds it connected to surface flows.

1521. If adjudicated is not available, this report should recommend the re-opening of the adjudication.

1529. This statement is obviously not being taken into consideration and this study should document where this is being ignored in relation to groundwater.

1542. Whether the use of a unified water-master is needed should be addressed in this study.

1553. The extent of which the groundwater diversions are affecting the Forest Services water rights and Section 5937 of the Fish and Game code should be analyzed.

1686. Needs as far as flow for salmon should be identified by the Department of Fish and Game and this study should show how groundwater pumping and interconnection relates to meeting these base flows.

1769. The way that stream modifications (bulldozing, seasonal dams, ext) effect groundwater inflow and outflow should be analyzed along with diversions

1818. It is important to calculate how ground water diversions are affecting these numbers and to estimate what the difference would be without any wells.

1833. What is this estimate based on? It seems low.

Note on section: What evidence exists to show that the Westside of the Valley is the only area contributing to groundwater inflow.

1920. Plan should include plans for the closing of observation wells, so they are not utilized or abandon after the study is complete.

2003. For the purpose of gathering good date flow meters and gauges should be continuous, not a one time measurement, as watering needs may change from day to day.

2058. Due to the fact that it is believed that a greater area then the area near the stream is affected by ground water pumping and a wide area around the stream are affected by groundwater pumping through the valley, a larger area should be studied.

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2120. Tracers need to be proven salmon and drinking water safe.

2273. Land owners with adjudicated water rights must prove they are not taking more then there right and therefore are responsible to meter. The Department of Water Rights and Cal Fish and Game should be involved and should encourage not cooperating well owners to be involved as it is against the law for people to violate water rights.

2292. Due to the proven hydraulic connection between groundwater and the river flows groundwater diverters should also be required to meter their diversions by Fish and Game.

2421. Water use is decided by water rights, which should be monitored. In places with no water master water use must be monitored buy water rights holders. There is no question that water rights are being violated in some degree in the Scott Valley and water right holders should be documenting use.

2556. Water management scenarios should focus on water efficiency and savings and include metering of all diversions.

2746. Tribes and non-profits should be involved with defining BMP's. Siskiyou County and the Siskiyou County RCD have a well know bias against regulation and good management of resources. Due to their anti-tribal and anti conservation attitude many agencies have let them define studies and legal processes to get their cooperation. This is unethical and illegal as the County represents only a minority of the people whom depend on the Scott River and often hurts rather then helps efforts such as this study. The only reason there has not been slurry of lawsuits relating to this fact is that the community really wants to see things such as the Scott River Groundwater study and Scott River TMDL get done so on the ground changes can occur. However the lack of participation by anyone the county does not like, including tribes, has only hurt the processes in place and had lead to decisions and planning that is not balanced or fully informed. This process cannot follow this same pattern.

2752. Quality of water, not just amount, should be considered while creating BMP's
2793. Attempts to gather data from all water rights holders and groundwater pumper's needs to be attempted to clarify information.
2872. The Scott River salmon do not have 20 years to wait for action. Information should be reviewed and presented to water managers every year or two and recommendations should be made, and management changed at these times.

Thank you for the opputunity to comment.

COMMENT 3

from the desk of Felice Pace

28 Maple Road Klamath, Ca. 95548 707-482-0354 unofelice@gmail.com

TO: Tam Doduc, Chair, SWRCB
John Corbett, Chair, NCWQCB
RE: **Comment on Scott Valley Groundwater Study Plan "Penultimate Draft" 10/9/07**
CC: Interested Parties

Dear Ms. Doduc and Mr. Corbett:

These comments are directed to you because the above referenced Study Plan does not conform to the urgent need for a directed study to provide reasonable assurance that actions designed to address the impairments of the Scott River are backed up by good information.

Instead what we have is a long-term study which – although it is 100% funded by the SWRCB - has been directed by other entities (most notably Siskiyou County) to meet their own needs and to provide a level of scientific underpinning and assurance that have not been applied to other restoration projects in this Valley most of which have clearly benefited landowners but many of which have been of questionable benefit – or in some cases even harmful to - water quality, fisheries and wildlife[1]. This raises serious questions about whether Siskiyou County and the Siskiyou RCD are good faith partners in efforts to address impairments to the Scott River.

It is important to consider this Study Plan within the context of the current situation in the Scott River. This fall flows declined to less than 10 cfs while full irrigation – at least half of it from the 228 unregulated irrigation wells in the County proceeded fully. Chinook are now not able to make it to the prime spawning grounds in and above Scott Valley even in average water years. In drought years Coho are delayed in Scott Canyon (lower 10% of the watershed). This amounts to a serious threat of extirpation/extinction and – unless significant action is taken soon to address the situation – is likely to result in a petition to list Scott Chinook under the state ESA.

Under these circumstances the goal of the Study Plan can not be complete confidence or complete knowledge (which is not what science can deliver in any case) but rather producing information and professional judgment within a reasonable time period (max of 1 year) that will allow actions to be formulated with substantial but not complete confidence.

Specific Comments on the Draft SP:

1. A two phased study plan should be developed.

While the comprehensive nature of the SP is appreciated, given the urgency of the situation – and the fact that the funding has been supplied for more limited purposes – the SP should be redrafted into two stages:

Phase 1 should focus on providing good quality information as soon as possible including:

a. Evaluating current information (including FWS monitoring wells, Mack/USGS, DWR/1975, and USFWS in press) and old maps that show the location of springs on the

[1] This assertion is well documented and I would be happy to provide specifics to NCWQCB and SWRCB upon request.

Westside in the alluvial fans) to determine what can be reasonably concluded (and with what level of confidence) about the impact of groundwater pumping on spring accretion, and the impact of groundwater pumping on flows in the mainstem.

b. Targeted investigations to fill data gaps and sufficient to provide 75% probability determination re impacts of groundwater pumping on springs, accretion and flows.

c. Recommendations re interim prudent measures to prevent additional impacts of groundwater pumping on springs, accretion and flows.

There should be a deadline set for delivering Phase 1 equal to 1 year from approval of study plan by NCWQCB/EPA.

Phase 2: The more ambitious “Cadillac” study presented in the draft Study Plan should be reworked into a second phase on a longer time frame.

2. It is critical that the Study Plan and the study itself be perceived by all stakeholders as unbiased. The current Study Plan does not appear to be unbiased.

The Land Grant universities in general and the UC Extension in particular have well documented biases that are the result of history. Whether or not the individuals involved in this study plan exhibit such a bias is irrelevant since we are dealing with perception. But it is essential that all stakeholders have confidence that the study will be designed and conducted without bias. For this reason the following approaches are strongly recommended.

a. This and subsequent study plans should be peer reviewed by independent professionals not associated with UC Extension and specifically chosen by NCWQCB and EPA respectively in consultation with QVIR and Siskiyou County.

b. Individuals with a personal interest in maintaining the status quo on groundwater pumping should not be advisors to this study. For example, one of the advisors has a family business (nursery) that was developed less than 10 years ago and which pumps extensively from within 300 feet of the Scott River. This individual should not be an advisor or employed in the study. The same holds for any individual who has an irrigation pump that is not adjudicated as part of surface flow as well as others who have a personal financial interest in the outcome.

3. The County and RCD are applying a different standard for information to justify restoration projects associated with the TMDL groundwater issues than they have ever applied before to any other restoration project. If this standard of information surety were applied to all restoration projects in the Valley, the RCD would be out of the restoration business. This divergence indicates a county/RCD bias which calls into question whether they are a good faith collaborator with the NCWQCB.

It is recommended that substantially the same standard of information surety be applied to information to inform restoration actions associated with groundwater and flows as is applied to the $20-$30 million in restoration projects which have been implemented by the RCD. It should be noted that those expenditures include grants from the SWRCB and NCWQCB under 319 j and other programs that have not required the sort of comprehensive long-term surety which is being applied in this case.

Sincerely,

Via e-mail
Felice Pace

COMMENT 4 (QVIR and Kier Associates)

Quartz Valley Indian Reservation
13601 Quartz Valley Road
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ph: 530-468-5907 fax: 530-468-5908

November 20, 2007

Ground Water Study Team
UC Cooperative Extension Groundwater Hydrology Program
University of California
Davis, CA 95616

Dear Study Team,

The Quartz Valley Indian Reservation is located in the Scott River watershed and the community of Quartz Valley is very concerned about the Scott River watershed health as it relates to salmon and steelhead recovery. Surface and groundwater extraction represent significant limiting factors for the recovery of these species. Salmon have been relied upon for sustenance of our community and downstream Tribes for thousands of years.

We would like to protest the exclusion of our Tribe from your draft study plan development to date. We are stakeholders in the Scott valley and should be given the same respect and participation that the other stakeholders were given. Your draft specifically states that the North Coast Regional Water Quality Control Board envisioned the Quartz Valley Indian Community working cooperatively on the groundwater plan and we look forward to an explanation as to why this has not yet taken place. We expect you to rectify this in the future.

We look forward to working with you.

Sincerely,

Harold Bennett, Tribal Chairman
Quartz Valley Indian Reservation

CC: Bryan McFadin, Robert Klamt, Luis Rameirez NCRWQCB
Susan Corum, Karuk Tribe Natural resources Dept.
Kevin McKernan, Yurok Tribe Environmental Dept.
Ken Norton, Hoopa Tribal EPA
Phil Smith, Resighini Rancheria EPA

INTRODUCTION

Kier Associates has reviewed the *Draft Scott Valley Community Groundwater Plan (Draft Plan)* (Harter and Hines, *In review*) on behalf of the Klamath Basin Tribal Water Quality Work Group (Work Group), an alliance of water quality research and environmental protection departments of five federally recognized lower Klamath Basin Tribes. The Work Group was formed following the devastating September 2002 Klamath River adult salmon kill to work proactively on water quality recovery by supplying sound and timely science products and interpretations to government agencies to assist in programs and processes of possible assistance to the river. The Work Group views Clean Water Act compliance as a means to ensure the future of salmon and the continuance of a tradition of fishing and fish conservation by the Tribes.

Before addressing the content of the *Draft Plan*, a note on process is necessary. The report notes that it is the explicit wish of the North Coast Regional Water Quality Control Board (NCRWQCB) that the Quartz Valley Indian Community (QVIC) be recognized as a cooperator in this ground water study. QVIC has not been consulted by the developers of the *Draft Plan* despite their Reservation being squarely within the Scott Valley.

SUMMARY OF COMMENTS

Overall, the *Draft Scott Valley Community Groundwater Plan* presents some useful information and ideas. It fails, however, to draw sufficiently on available information. And it fails to recognize the extent of stream habitat impairment that has occurred, and that continues to occur in the Scott River watershed.

To provide background regarding Scott River water and fisheries issues, we recommend that the groundwater study authors review comments (Kier Associates, 2005; QVIC 2006a, 2006b, 2006c) that the Work Group provided the State during development of the *Scott River Sediment and Temperature TMDL* (NCRWQCB, 2006), the genesis of the groundwater *Draft Plan* and the California Department of Fish and Game's (CDFG) Incidental Take Permit (ITP) process (CDFG, 2006). Additionally, TMDL comments by PCFFA et al. (2006) also provide important information. The most relevant of these documents are included here as Appendices (A-C).

The groundwater study plan calls for a major monitoring, research and modeling effort that would, were it ever implemented, produce long-term, high-quality information useful in environmental decision-making in the Scott River watershed.

We are concerned, however, that the ambitious measured called for in the *Draft Plan* will not provide enough useful information in the near-term. The restoration of water quantity and water quality in the Scott River is an urgent matter. The *Draft Plan* is recommending studies the cost of which will be quite high at precisely the moment that the State's fiscal condition is rapidly worsening.

The study plan needs to be improved by providing a better understanding of its phasing, the basis for prioritizing its steps, and the probable cost of its steps.

The *Draft Plan* fails to make clear just how rapidly the Scott River watershed groundwater and surface water situation has worsened since the major expansion in groundwater pumping began in the mid-1970s. Scott River instream flows have shriveled in the past decade. Instead of making clear the severity of the problem the Draft Study resorts to platitudes like "It will be more cost effective to discover and prevent problems before they occur in review" (p. 1).

A review of available information, provided in our comments below, clearly shows that there is a crisis in water quality and quantity in the Scott River Valley. Populations of coho salmon and fall Chinook salmon are at critically low levels. What is needed is an adaptive management program in which immediate measures are taken to decrease groundwater pumping and surface diversions, with studies to document how instream water quantity and quality respond to such measures.

We recognize that the groundwater study plan is by its nature only a study plan, and that its authors are not in the position to command reformation of Scott River water resource management; however, the point we raise above about the need to recognize the present severe degree of impairment and the need for urgent action are, in fact, relevant to the shaping of the goals and methods of the proposed study.

STUDY PLAN SHOULD PROVIDE MORE DETAIL ON PHASES AND PROBABLE COSTS

As noted in our summary above, the study plans calls for a massive monitoring, research and modeling effort. There are no assurances, whatsoever, that funding for an effort of the proposed scale will ever materialize.

It is prudent, therefore, to provide a clear and concise list of study phases and priorities. It is understandably difficult and painful to whittle a master plan down to a smaller list of core elements, but this must be done. The cost estimate listed for Phase 1 alone is $2.5 million, a very large sum. Phase 1 currently has multiple sub-components, but the priority ranking and specific utility of each is not clear. We recommend that Phase 1 be split into smaller pieces, listed in order of priority, and a justification be provided as to exactly what would be learned from each piece, and why one piece should take priority over another.

STUDY PLAN SHOULD BEGIN BY EVUALUATING EXISTING DATA

Before launching into a multi-million-dollar data collection effort and development of a state-of-the-art model, it would first be prudent to analyze existing data to determine what is already known about historic changes to the surface and ground hydrology of the Scott River watershed. What we are suggesting here is different than the construction of a computer model that simulates surface water/groundwater interactions (Phase 1a of the study plan); it is more simple analyses, as follows:

1. Looking at trends in low-flow conditions in the Scott River flows. For instance:

- Has there been a change in the number of days per year with flow <20 cfs (and <40 cfs) at the Fort Jones USGS gage since data collection began in 1942?
- Has there been a change in the minimum monthly flows at the Fort Jones USGS gage since data collection began in 1942?

2. What are the long-term trends in the number of wells in the Scott Valley, including their pumping capacity, and how does the timing (on a scale of years/decades) of well installation compare with any changes in streamflow over time?

3. What do 1972 and 1973 data collected by the State Water Resources Control Board (SWRCB, 1974) show about the magnitude and locations of groundwater accretions to various reaches of the river? How do those data compare with similar data collected in 2003 for the *Scott River TMDL* and, again in 2006-2007?

4. What is the pumping capacity of Scott Valley wells?

Answering the questions above is neither difficult nor expensive, yet would yield valuable information and should be part of any sober effort to determine how groundwater hydrology and groundwater extraction may influence Scott River stream flows.

We request, therefore, that such analyses be conducted by the groundwater study team as a priority.

EVIDENCE OF DEGRADED AQUATIC HABITAT CONDITIONS IN THE SCOTT RIVER WATERSHED AND THE ROLE OF GROUNDWATER

Effects of groundwater pumping on riparian vegetation

While the *Draft Plan* cites the need to "evaluate effects of groundwater on the health of riparian vegetation," it ignores the known riparian degradation of Moffett Creek attributable to groundwater extraction (Kier Associates, 1999). Figure 1 shows lower Moffett Creek and its lack of riparian trees. This stream once harbored coho salmon, steelhead and Chinook salmon but has now been reduced to a degraded steelhead-only stream. An appropriate goal for a groundwater study would be to test what actions are needed to restore surface flow to Moffett Creek and to revive its riparian zone.

Large sums are proposed for studies in the *Draft Plan* but there is little mention of incentives for land owners to modify cropping patterns, sell easements or install water conservation equipment in the near term.

Figure 1. Moffett Creek in August 1997 after the January 1997 storm and subsequent bulldozing. Note the lack of riparian trees due to the drop in the groundwater table (Kier Associates, 1999). Photo from KRIS Version 3.0.

Effects of tributary diversions

The *Draft Plan* states that "Diversions of surface water lead to relatively small temperature impacts in the mainstem Scott River, but have the potential to affect temperatures in smaller tributaries, where the volume of water diverted is large relative to the total flow." In fact, the mainstem Scott River not only experiences significant temperature problems because of flow depletion (Figure 2 and 3), it also loses surface flow altogether in some reaches due to agricultural water withdrawals (Figure 4). Temperature impacts don't get much more dramatic that that!

Major salmon and steelhead-bearing tributaries also have more than temperature problems, losing summer and fall surface flow due to diversions (e.g. Shackleford Creek, Kidder Creek, and Etna Creek). All stream reaches that are currently de-watered were formerly good-quality salmon rearing areas. QVIC (2006b, 2006c) has pointed out repeatedly that this dewatering is illegal under CDFG Code 5937.

In aggregate, water withdrawal in tributaries of the Scott River severely depletes mainstem flows and causes problems related to transit time, water temperature and water quality. A good example of this is the lower mainstem Scott River in the canyon below Kelsey Creek on U.S. Forest Service lands (Figure 5). Slow transit time through this exposed, parabolic reach of the Scott River warms the stream significantly and degrades its capacity for salmon (see Anadromous Fish).

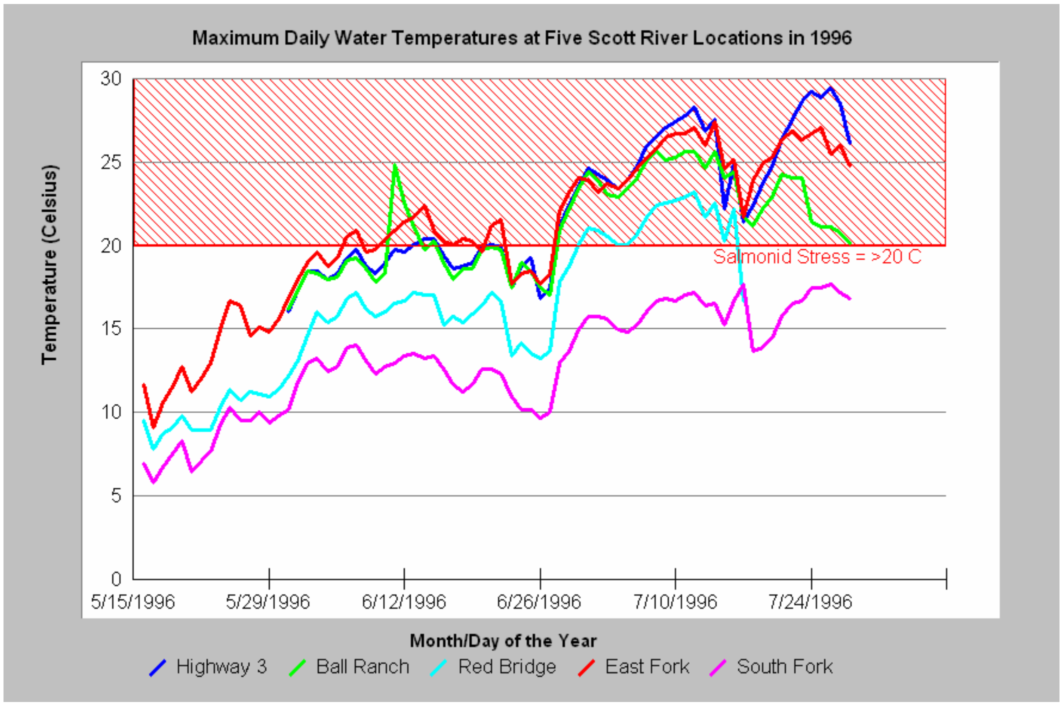

Figure 2. Water temperature at various Scott River mainstem locations in 1996. Flow depletion slows streamflow transit time and increases thermal loading. Chart from KRIS V 3.0 and data from the Siskiyou Resource Conservation District.

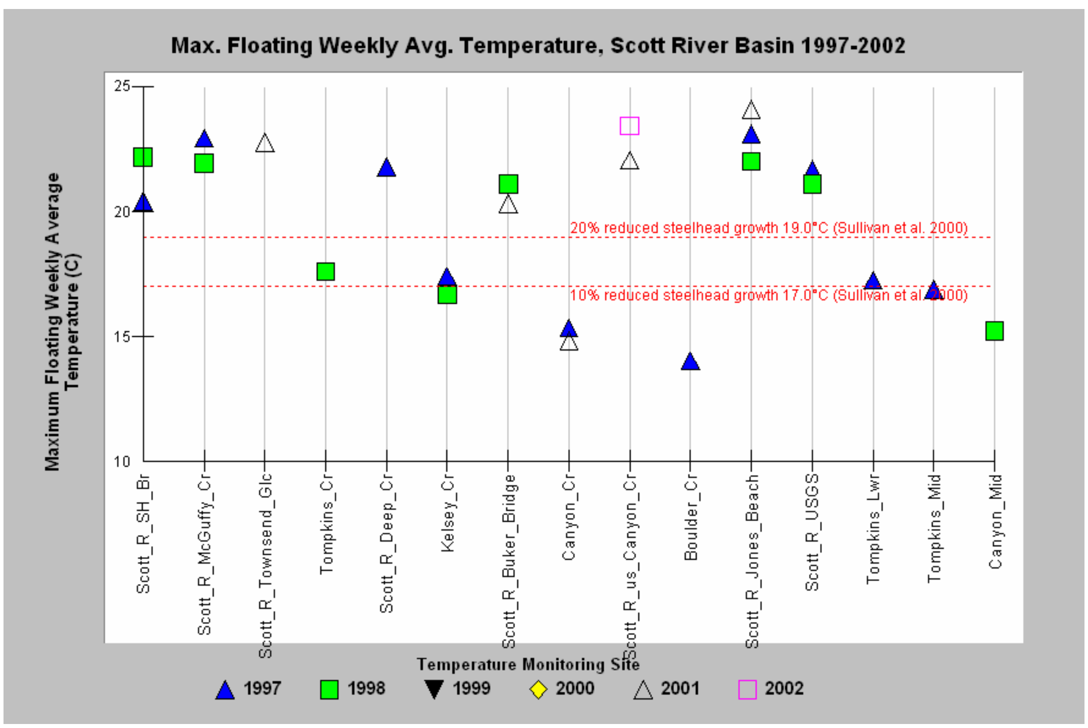

Figure 3. Maximum floating weekly average water temperature (MWAT) for several mainstem Scott River and tributary locations shows that lower Scott River water quality is stressful for salmonids and provides only marginal rearing habitat. Data from the Karuk Tribe and USFS.

Figure 4. Mainstem Scott River lacking surface flow in late summer 2002 between Fort Jones and Etna. Photo by Michael Hentz from KRIS V 3.0.

Figure 5. Photo of lower Scott River canyon shows very low flow and open exposure to sun in parabolic gorge that promotes warming. Michael Hentz photo from KRIS V 3.0.

Trends in Scott River groundwater extraction

The *Long Range Plan for the Klamath River Basin Conservation Area Fishery Restoration Program* (Kier Associates, 1991) noted that ground water pumping in the Scott River valley depleted surface flows because of the interconnection between surface- and groundwater. This fact was also clearly noted in the *Scott River Adjudication* (CSWRCB, 1980) and in earlier work by the U.S. Geologic Survey (Mack, 1958).

The California Department of Water Resources (CDWR) unpublished well log data (Eaves, personal communication) indicate that the installation of irrigation wells continues in the Scott River Valley (Figure 6). The greatest number of wells installed in the Valley occurred in the 1971-1980 period. After a slump in installations between 1981 and 1990 the number of new wells increased once more during the 1990's and continues to the present. Not all well installations are reported. CDWR estimates their record may be 30-50% low. Data from 2005-2007 have not been recorded and data from 2001-2004 are provisional.

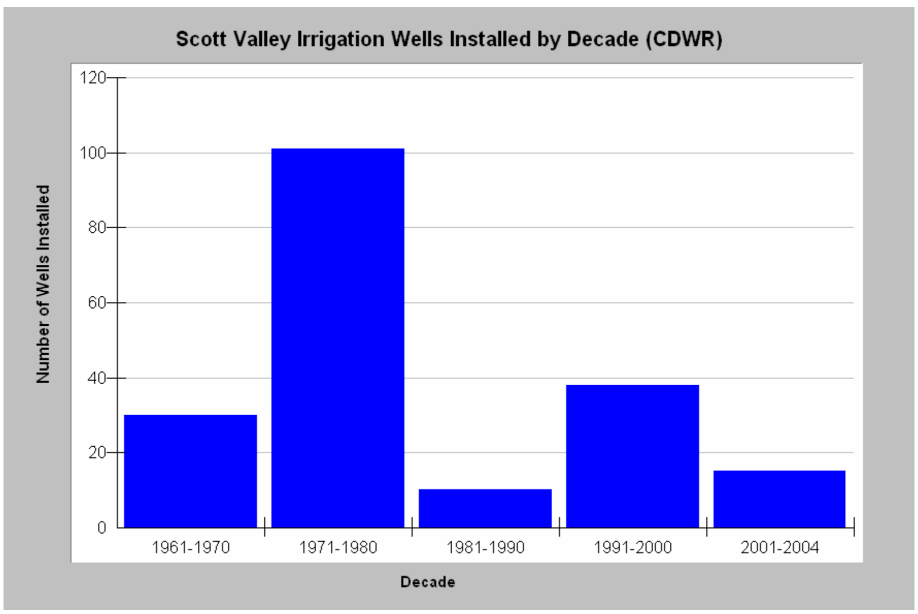

Figure 6. The number of new irrigation wells recorded by the California Department of Water Resources by decade 1961-2004 (Eaves, personal communication). Figurre from PCFFA et al (2006).

Although the number of pump installations may have diminished over time, the installation of just a few large capacity pumps can drive groundwater levels downward (USGS, 2005).

The U.C. Davis team needs to assemble a current inventory of all wells, including the pumping capacity of each.

Trends in Scott River streamflow

The *Draft Plan* describes trends in Scott River flow for only a very limited period. Figure 6 shows the 2007 Scott River summer and fall flows with reference lines showing the flows required flows to meet SWRCB (1980) adjudicated levels. This chart shows flows as low as 5 cubic feet per second (cfs), or less than one sixth of those required by adjudication.

Prior to 1977, Scott River flows *never* dropped below 20 cfs (Figure 7). Despite assertions(by Drake et al. 2000) that flow depletion is a product of climate change, the number of days in which Scott River flows have dropped below 20 cfs have increased steadily in recent years, even when precipitation has been moderate to high (Figure 8).

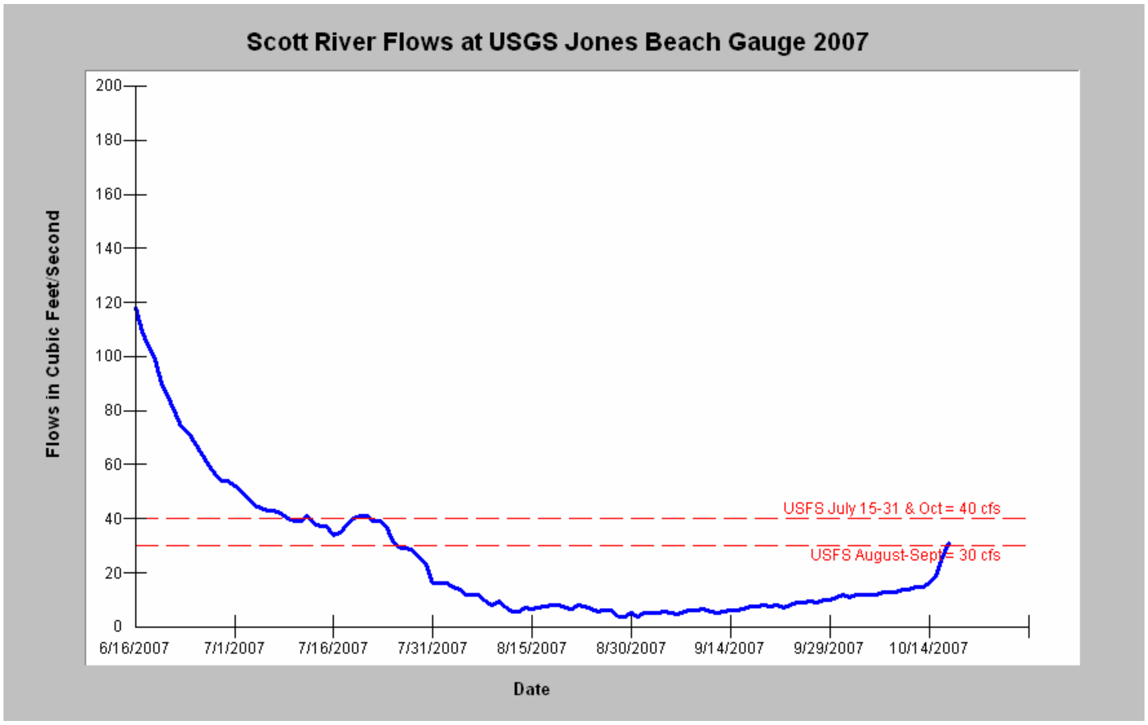

Figure 7. USGS flow gage results for 2007 show major lapses in meeting SWRCB (1980) adjudicated flow levels. These low flows cause stream warming and create significant risks for the survival of juvenile salmonids in the lower Scott River.

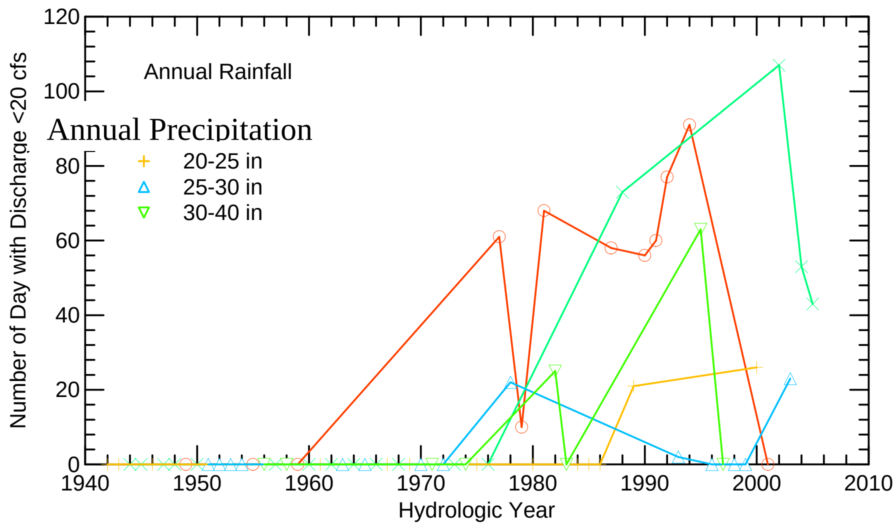

Figure 8. This chart shows the number of days that the Scott River fell below 20 cfs at the USGS gauge below Ft Jones, with years with similar annual precipitation grouped together. Note that there were 60 days of flows less than 20 cfs even in a recent wet year (1998/30-40 inches of rain). Figure from PCFFA et al. (2006).

The status of salmon and the effects of low stream flows on the risk of their extinction

There are clear signs that if immediate action is not taken to restore Scott River flows that Pacific salmon stocks in the basin will be lost (Rieman et al., 1993). When flows in the Scott River gorge on U.S. Forest Service lands are not met, habitat that once served as critical refugia becomes marginal or unusable for juvenile salmonids. As low flows extend into the fall they block adult fall Chinook salmon migrations further into the basin.

The *Draft Plan* fails to note that Scott River fall Chinook salmon populations have fallen to critically low levels in recent years (Figure 9), heralding an elevated risk of extinction (Kier Associates, 1991; Gilpin and Soule, 1990). QVIC (2006c) has pointed out that only one of three year classes of coho salmon has been robust, a sign that that this population is at risk of extinction (Rieman et al., 1993). Summer steelhead and spring Chinook salmon that formerly returned to the Scott River have been extirpated or nearly so (Kier Associates, 1991).

Fall Chinook salmon that are unable to ascend into the Scott River Valley are trapped in the lowest six reaches of the river (approximately 25 miles, see Figure 10), where bedload movement and shifting sands makes successful spawning problematic (Kier Associates, 1999). The final ground water study should also acknowledge that there is currently a positive ocean productivity cycle that coincides with a wet on-land cycle (Hare et al., 1999).

These long-term weather cycles are likely to switch to less productive ocean conditions and a dry on-land climatic condition sometime between 2015 and 2025 (Collison et al., 2003). If flow conditions in the Scott River have not been remedied by then, Scott River Chinook salmon and coho salmon will most likely go extinct.

This should create a sense of urgency to remedy groundwater overdraft, not just study it.

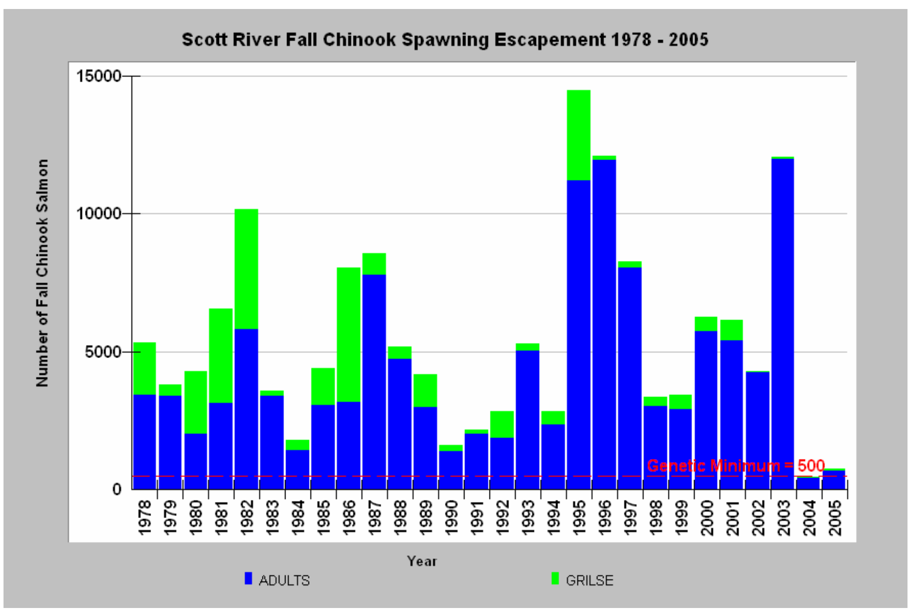

Figure 9. Scott River fall Chinook escapement, where both 2004 and 2005 are the lowest years on record, bringing the resource to the lower limit of viability (Gilpin and Soule, 1991). Data from CDFG.

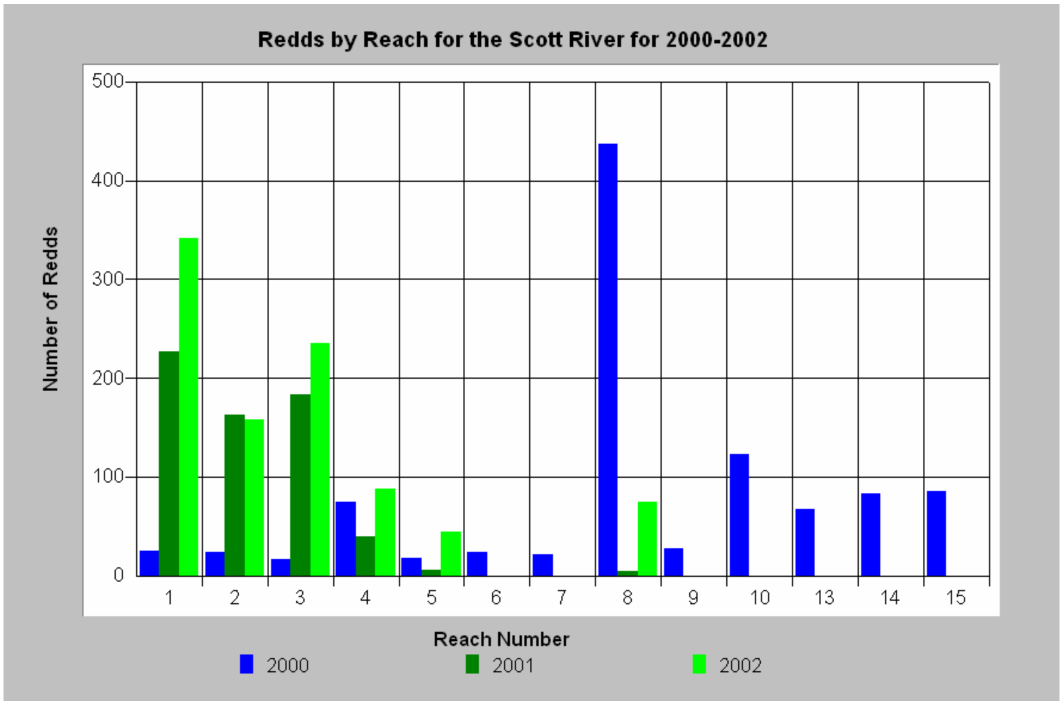

Figure 10. Fall Chinook salmon spawned, for the most part, in the lowest five reaches of the Scott River in 2001 and 2002, because flows were insufficient to pass fish upstream. Data from CDFG.

Review of historic Scott Valley groundwater data

The presentation and discussions of historic Scott Valley groundwater data on pages 22-23 of the *Draft Plan* is incomplete and needs to be improved. Data for only three of the five long-term monitoring wells are shown in Figure 3-3. This should be revised to include data from all five wells. The short y-axis of the graph and the one low outlier make the graph difficult to interpret.

Detailed graphs of each of the five wells are contained in QVIC (2006a), included here as Appendix A. An examination of these data show that annual maximum levels have remained relatively constant over time (fluctuating with precipitation), but that annual minimum levels have declined since 1965 (though they, too, fluctuate with precipitation).

For example, at well 42N09W27N001M, water surface elevation never dropped below 2920 feet prior to 1980, but now drops well below that consistently even in years with relatively high precipitation (Figure 11).

The groundwater study needs to be revised to explain these declining minimum annual levels, or alternatively, provide some discussion why these data are not useful.

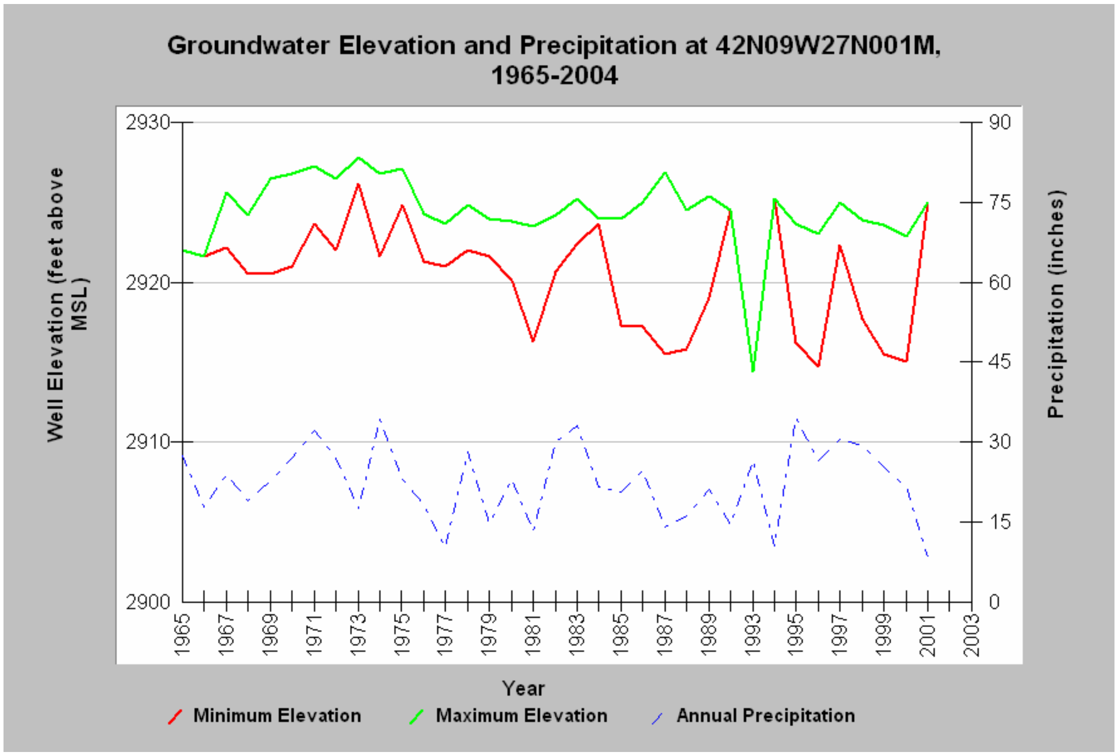

Figure 11. California Department of Water Resources well 42N09W27N001M, which is approximately 8 kilometers east of Etna, for the years 1965-2001. Figure from Kier Associates (2005).

Effect of groundwater accretion on mainstem water temperatures

The *Draft Plan's* statement that "While the TMDL temperature source analysis found that changes in groundwater accretion and surface water flow can have a deleterious effect on stream temperatures and the beneficial uses associated with the cold water fishery…" (Page 3, lines 118-121) should be improved by the inclusion of some details regarding the *Scott River TMDL* model results (NCRWQCB, 2006), and should note that the TMDL model also found there would be major benefits to increasing groundwater accretions. For example, a doubling of groundwater accretions was predicted to decrease temperatures by 5-10˚ C (Figure 12).

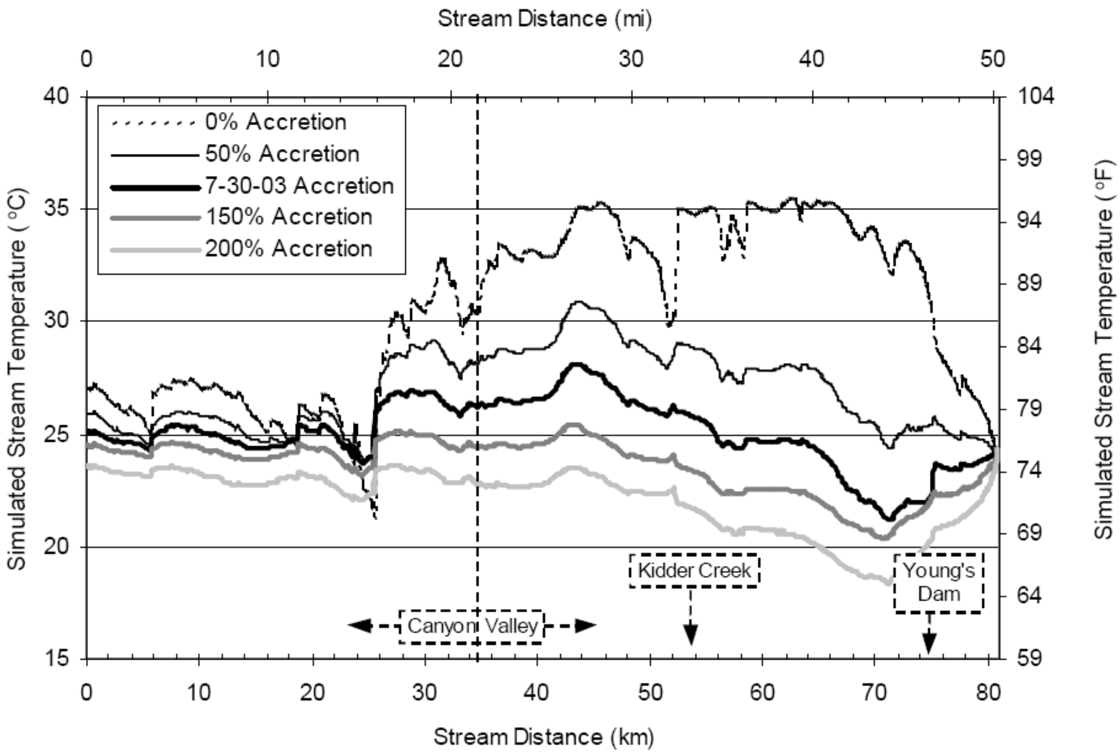

Figure 12. Longitudinal profiles of temperature modeling results that quantify the effects of groundwater accretion, Scott River mainstem; 3:00 PM, July 30, 2003. Adapted from Figure 4.13 of Scott River TMDL Staff Report.

DATA CONFIDENTIALITY ISSUES

The *Draft Plan* suggests the expectations that the "Scott Valley Community" has for the groundwater study: "Future groundwater studies would include confidentiality of water table data collected on private land." (p. 6).

It is our position that all data and models used in the groundwater study should be publicly accessible. Transparency is essential to the scientific process and models that do not clearly state their assumptions, which fail to share the mathematical formulas upon which relationships are determined, and which fail to provide the raw data used for modeling are not valid (Collision et al., 2003). If data are confidential, then there is no way to verify analyses and models, and therefore the results cannot be reliable nor effectively used in the public arena.

The groundwater study plan should state that <u>all data used in the study will be publicly shared</u>.

ADDITIONAL AVAILABLE DATA SOURCES

The list of available data sources in section 7.3 (page 72) fails to mention either the U.S. Forest Service and Karuk Tribe combined temperature database, which includes 15 sites in the Scott River watershed. This dataset is available online as part of the Klamath Resource Information System (KRIS). The data are accessible online by simply following the links at the bottom of the web page http://www.krisweb.com/krisklamathtrinity/krisdb/webbuilder/md_cst30.htm and a map of sites is available at: http://www.krisweb.com/krisklamathtrinity/krisdb/webbuilder/sc_m3.htm

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<http://www.usbr.gov/mp/kbao/docs/Final_USGS_Assessment_of_Water_Bank.pdf>

APPENDICES

To provide important background information, we are attaching the following relevant documents as appendices:

A. QVIC's (2006b) comments on the Scott River TMDL implementation work plan.

B. QVIC's (2005) comments regarding the draft Scott River TMDL. In particular, see the appendix in which reviews historic Scott Valley groundwater data.

C. Conservation groups' (PCFFA et al. 2006) comments on the Scott River TMDL.

COMMENT 4 - Appendix A

6/7/06 Bd Mtg: Scott River-
Item__ Deadline 5/10/06

Quartz Valley Indian Reservation
13601 Quartz Valley Road
Fort Jones, CA 96032
phone: 530-468-5907 fax: 530-468-5908

May 10th, 2006

Song Her, Clerk to the Board
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

RE: Comment Letter - Sediment and Temperature TMDL in the Scott River Watershed

Dear Song Her,

Quartz Valley Indian Community (QVIC) of the Quartz Valley Indian Reservation (QVIR) thanks you for the opportunity to comment on *The Action Plan for the Scott River Watershed Sediment and Temperature Total Maximum Daily Loads (TMDL)* amendments to the North Coast Regional Water Quality Control Board *Basin Plan* on how to improve the implementation plan and specific recommendations on flow options that the State Water Board might take in the watershed.

Quartz Valley Indian Reservation is located in Scott Valley on a major tributary, Shackleford Creek, to the Scott River. I would like to stress the Tribe's sentiment that the state of the Scott Watershed is in peril and needs immediate attention and action. The implementation schedule is not timely enough to protect the watershed in the face of climatic changes, future development, and increased land use. My people have seen the creeks and rivers of Scott Valley dry up and become seasonal waters. We have seen populations of coho, Chinook, steelhead, and lamprey severely decline in the Scott Watershed. To us, water is life. We are concerned about the future of our lives and call upon the North Coast and State Water Boards to protect and heal this watershed.

We appreciate the efforts of your staff in the creation of this document and the development of the Scott TMDL. Please find below the attached official comments of the Quartz Valley Indian Community.

Sincerely,

Harold Bennett, Vice-Chairman Quartz Valley Indian Reservation

Cc: Beverly Wasson, Chairperson, North Coast Regional Water Quality Control Board
John Corbett, Vice-Chair, North Coast Regional Water Quality Control Board
Dr. Ranjit Gill, North Coast Regional Water Quality Control Board
David Leland, North Coast Regional Water Quality Control Board
Bryan McFadin, North Coast Regional Water Quality Control Board
Rebecca Fitzgerald, North Coast Regional Water Quality Control Board
Art Baggett Jr., State Water Resources Control Board
Adrian Perez, State Water Resources Control Board
Tim Wilhite, United States Environmental Protection Agency
Janis Gomes, United States Environmental Protection Agency
Gail Louis, United States Environmental Protection Agency

Streamflow Issues

The *Scott TMDL Amendment* to the *Basin Plan* depends upon voluntary action to increase streamflows to levels needed to support beneficial uses: "The Regional Water Board encourages water users to develop and implement water conservation practices." This contradicts the recognition in the amendment narrative that: "Diversions of surface water... have the potential to affect temperatures in smaller tributaries where the volume of water diverted is relatively large compared to the total stream flow."

We have previously noted that surface water diversion in Shackleford Creek, for example, is directly causing the stream to warm and dry before reaching the Scott River, resulting in a total loss of the creek's juvenile and adult salmon and steelhead carrying capacity. This observation was based on thermal infrared radar (TIR) data collected for the Scott River TMDL (Watershed Sciences, 2003). This is a clear case of streamflow diversions linked to water quality and its ability to support beneficial uses.

Previous comments by the Quartz Valley Indian Reservation cite legal precedents that authorize and, arguably, require water quality authorities to take steps to improve streamflow when reduced streamflow is the obvious driver of water pollution.

The inability of the Scott River's reduced streamflow to support beneficial uses is a clear issue in the Scott River canyon. The *Scott River Adjudication Decree* (SWRCB, 1980) mandated minimum flows (Table 1) to support aquatic ecosystem function: "These amounts are necessary to provide minimum subsistence-level fishery conditions including spawning, egg incubation, rearing, downstream migration, and summer survival of anadromous fish, and can be experienced only in critically dry years without resulting in depletion of the fishery resource."

Table 1. Absolute minimum instream flows to be provided U.S. Forest Service lands in the Scott River canyon as set out in the 1980 *Scott River Adjudication*.

Months	Minimum Flow in CFS
November - March	200
April - June	150
June 16 - June 30	100
July 1 - July 15	60
July 16 - July 31	40
August - September	30
October	40

That the mandated streamflow levels in Table 1 are <u>not</u> being met argues that the SWRCB should be pursuing enforcement actions, rather than relying upon volunteer actions as proposed in the Scott TMDL.

The SWRCB should develop and adopt a program of supervision of the California Department of Fish and Game's (CDFG) program of issuing stream diversion permits under

Fish and Game Code Section 1600 et seq. Such permits should be granted only in cases where sufficient streamflow will be left in the stream to support beneficial uses.

CDFG's permits cannot, by law, be granted for a period of more than five years. SWRCB oversight of CDFG permit renewal should require that a determination be made that the renewal of such diversion permits will not interfere with the attainment of other beneficial uses of water.

It is within the SWRCB's authority and responsibility to provide oversight and additional necessary control of CDFG's issuance of streamflow diversion permits in the Scott River basin.

The inability of the Scott River to attain the minimum streamflows adjudicated to the Scott River canyon is due in significant part to an increase over the past 30 years of well drilling and pumping for irrigated agriculture directly from the aquifers that support the Scott River's surface flow system. The QVIC presented well log data collected by the California Department of Water Resources (DWR) that clearly demonstrates that groundwater recharge has diminished over time as the number of wells in the Scott River valley has increased.

The *Scott River TMDL Amendment* designates Siskiyou County as the entity to investigate streamflow/groundwater interactions. This is an inappropriate delegation of responsibility by the State on two counts: the County has no demonstrated competency in the conduct of such groundwater investigations, and the County's investigators may be partial to the local landowner water users.

SWRCB staff or SWRCB designees (for example, DWR) should retain responsibility to the impartial and timely completion of the Scott River valley groundwater use/surface water relationships investigation. If the data support the conclusion that groundwater pumping is dewatering the Scott River, the SWRCB should expedite actions to reduce such pumping. And, in the interim, SWRCB should restrain development of further wells in the Scott River valley floor.

Finally, if it is determined that groundwater is interconnected with the surface flow of the Scott River, the SWRCB should inform the Siskiyou County Superior Court of the need for timely review and appropriate revision of the Scott River Adjudication.

QVIIC has noted in previous comments that cumulative watershed effects related to logging are increasing sediment loads, which cause the streambed to widen and, in the worst cases, the loss of surface flows altogether during low flow periods. The SWRCB should set prudent risk limits for disturbance in the Scott River watershed by logging and road building and prohibit or severely restrict these activities on unstable areas like decomposed granitic soils and landslide zones.

Timelines

All comments on the *Scott River TMDL* provided by QVIC to the SWRCB have emphasized that the Pacific Decadal Oscillation (PDO) cycle greatly influences both the productivity of ocean conditions and the wet-dry cycles onshore that effect Pacific salmon populations. We are currently in a good ocean and wet onshore cycle. These conditions are likely to reverse, however, some time between 2015 and 2025 (Collison et al, 2003). The 40 year timeline for recovery of the Scott River is, therefore, unacceptable to the Quartz Valley Indian Community because salmon species may be lost if conditions are not improved sooner.

Fall Chinook salmon adult spawning returns to the Scott River in 2004 and 2005 were the lowest on record (467 and 756) and are dangerously close to the minimum population size needed for maintaining long term genetic viability of this stock (Figure 1). Higgins et al. (1992) discussed the risk of extinction of northwestern California Pacific salmon stocks and discussed minimum viable population sizes:

> "When a stock declines to fewer than 500 individuals, it may face a risk of loss of genetic diversity which could hinder its ability to cope with future environmental changes (Nelson and Soule 1986). A random event such as a drought or variation in sex ratios may lead to extinction if a stock is at an extremely low level (Gilpin and Soule 1990). The National Marine Fisheries Service (NMFS, 1987) acknowledged that, while 200 adults might be sufficient to maintain genetic diversity in a hatchery population, the actual number of Sacramento River winter run Chinook needed to maintain genetic diversity in the wild would be 400- 1100."

Immediate action is needed to prevent stock loss, not the longer, step-wise process contemplated in the *Scott River TMDL Amendment to the Basin Plan.*

While its provisions for road plans and plans for controlling erosion from roads is within a reasonable timeframe, the *Scott River TMDL Amendment* states that such plans will be required only on a site-specific basis. This means that only roads involved in new timber harvest activities or which have major histories of failure that are called to the attention of the NCRWQCB staff are likely to become the subject of erosion control plans.

Major problems can also result from the legacy of abandoned roads and skid roads that are not likely being examined by staff in the course of timber harvest review, but which can cause significant problems. As mentioned above, the SWRCB should consider limiting the road density in Scott River sub-basins to prudent risk levels.

The timeline suggested in the Temperature and Vegetation section of Table 4 is inappropriate, particularly since it requires only that "The Regional Water Board's Executive Officer report to the Regional Water Board on the status of the preparation and development of appropriate permitting and enforcement actions."

Landowners have removed large riparian cottonwood areas and immediate action should be taken to restrain further riparian forest removal. Kier Associates (1999) pointed out that "flood control" activities following the January 1997 storm had a disastrous adverse impact on riparian vegetation.

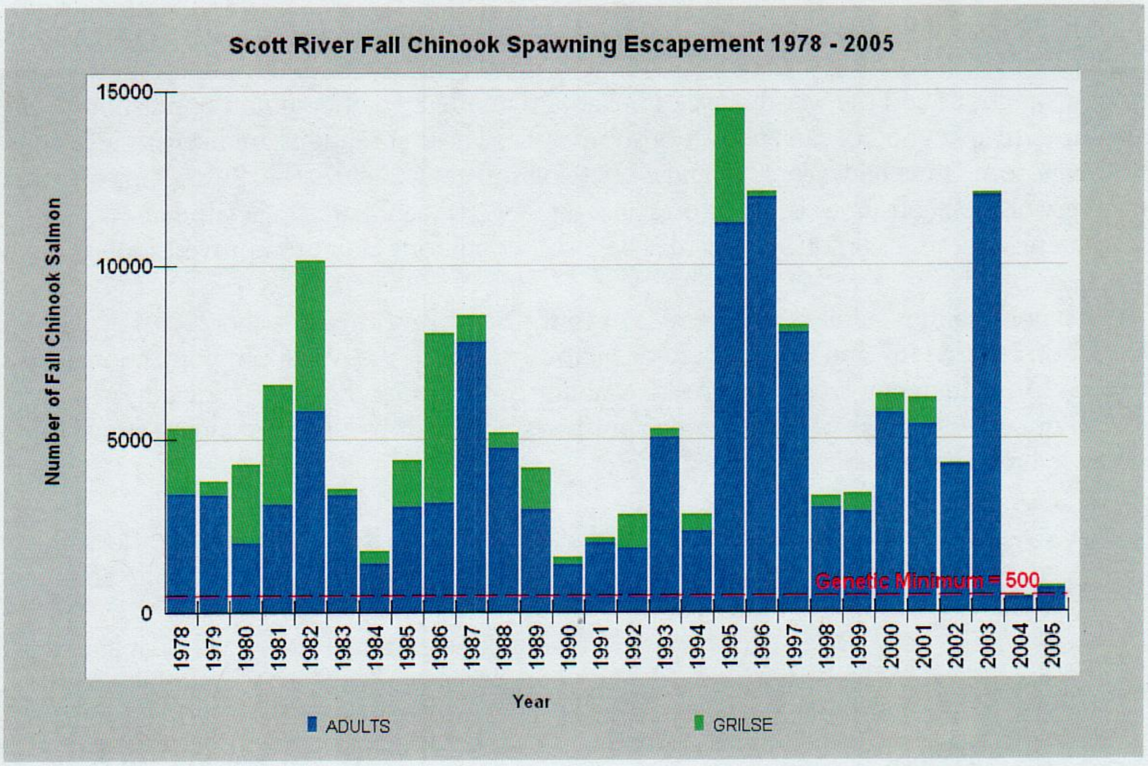

Figure 1. Scott River fall Chinook salmon returns showing a minimum viable population size reference from Gilpin and Soule (1990).

Previous comments on the Scott TMDL by the QVIC pointed out that timber harvest in riparian zones along coho bearing streams has been active in recent years. The riparian zones in historic coho streams are already heavily depleted, causing high stream temperatures and diminishing necessary large woody debris recruitment. Juvenile coho salmon remain in fresh water for at least a year and require cold water and pools scoured by large wood. Scott River coho populations are at very low levels and immediate action is needed to stop any further harvest of large trees within the riparian zone of streams where coho juveniles rear.

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Kier Associates. 2005c. Review of the pre-draft Scott River Watershed TMDL. Performed under contract to the Quartz Valley Indian Reservation on behalf of the Klamath Basin Water Quality Work Group. August 9, 2005. Kier Associates, Sausalito, CA. 31 p.

Kier Associates. 2005d. Lower West Side Scott Shallow Landslide Hazard Maps. Performed under contract to the Quartz Valley Indian Reservation by Dr. Jan Derksen of Kier Associates on behalf of the Klamath Basin Water Quality Work Group. September 18, 2005. Kier Assoc., Sausalito, CA. 11 p.

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Nelson, K. and M. Soule. 1987. Genetic Conservation of Exploited Fishes. In: N. Ryman and F.Utter (eds). Population Genetics and Fisheries Management University of Washington Press. Seattle, WA.

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COMMENT 4 - Appendix B

November 2, 2005

Catherine Kuhlman, Executive Officer
North Coast Regional Water Quality Control Board
5550 Skylane Blvd.,Suite A
Santa Rosa, CA 95403

Dear Ms. Kuhlman,

The Quartz Valley Indian Community of Quartz Valley Indian Reservation (QVIR), with the assistance of our consultants Kier Associates, have reviewed the public draft version of the North Coast Regional Water Quality Control Board's (RWB) Staff Report for the *Action Plan for the Scott River Watershed Sediment and Temperature Total Maximum Daily Loads* (Scott TMDL). As stated in previous comments, the Tribe hopes that the Scott TMDL will result in measurable and timely improvements in the water quality of the Scott River watershed. Please realize that QVIR is the only federally recognized, sovereign tribal government in the Scott Valley. The consideration that the Board gives to our comments should be representative of this fact.

We appreciate the efforts of your staff in the creation of this document and have worked with them to support the development of the Scott TMDL. With the assistance of our consultants, we have collaborated and shared data to assist in this process. The Board and its Staff should be well aware of QVIRs position on the Scott River TMDL. The Tribe has submitted past comments both verbally and in writing to the Board and Staff. Additionally, my staff and consultants have participated in the Scott River TMDL Technical Advisory Group. Regardless, please find attached the official comments of the Quartz Valley Indian Reservation regarding the Scott River TMDL and Implementation Plan.

The QVIR supports the concept of the TMDL. The Tribe would like to see the Scott River Watershed restored to historical healthy and sustainable conditions. Although we do have some remaining concerns with the document and question some of the implementation approaches, we feel overall that the Scott TMDL is a good place to begin with action towards restoring the historic water quality of the Scott River Watershed.

As stated previously, the Tribe supports a Scott Valley Groundwater Study. We question the sustainability of the current method of unlimited and unregulated groundwater extraction. The Tribe agrees with the TMDLs acknowledgement of the link between ground and surface water and was pleased to see the connection recognized by the Board. However, we question the ability of Siskiyou County to adequately conduct the study based on limited funding and technical capabilities. Agencies such as the Department of Water Resources and United States Geological Survey are better equipped and experienced to undertake a study of this magnitude and nature. We request that QVIR be intimately involved in the development and implementation of the groundwater study. Additionally, all data and information used and produced in this study should be transparent and publicly accessible.

We understand the Regional Board has limited staff and funding, therefore we would like to provide assistance by being involved in the implementation of the TMDL and working on a government to government basis with monitoring and restoration. Additionally, the Tribe would like to be a party in the suggested Memorandums of Understanding between federal agencies and the Regional Board.

I would like to stress the Tribe's sentiment that the state of the Scott Watershed is in peril and needs immediate attention and action. The implementation schedule is not timely enough to protect the watershed in the face of climatic changes, future development, and increased land use. My people have seen the creeks and rivers of Scott Valley dry up and become seasonal waters. We have seen populations of coho, Chinook, steelhead, and lamprey severely decline in the Scott Watershed. To us, water is life. We are concerned about the future of our lives and call upon the North Coast and State Water Boards to protect and heal this watershed.

Attached, you will find technical comments and recommendations. Please contact myself or my environmental staff at 530-468-5907 for further information or clarification on the issues discussed.

Thank you,

Harold Bennett
Vice Chairman

Cc: Beverly Wasson, Chairperson, North Coast Regional Water Quality Control Board
John Corbett, Vice-Chair, North Coast Regional Water Quality Control Board
Dr. Ranjit Gill, North Coast Regional Water Quality Control Board
David Leland, North Coast Regional Water Quality Control Board
Bryan McFadin, North Coast Regional Water Quality Control Board
Rebecca Fitzgerald, North Coast Regional Water Quality Control Board
Art Baggett Jr., State Water Resources Control Board
Adrian Perez, State Water Resources Control Board
Tim Wilhite, United States Environmental Protection Agency
Janis Gomes, United States Environmental Protection Agency
Gail Louis, United States Environmental Protection Agency

Summary of Comments

The public draft Scott TMDL reflects a lot of hard work by the NCRWQCB staff and its consultants. The maps provided are useful, the Guidance for Development of Erosion Control Plans (Appendix C) is exhaustive, and the narrative concerning the processes which impact sediment and temperature conditions is revealing. The recognition of the relationship between water extraction and stream temperatures is laudable.

There are still critical deficiencies in the Scott TMDL technical analysis and implementation plan that are likely to frustrate the success of temperature and sediment pollution abatement efforts and the restoration of coho salmon and other at-risk Pacific salmon species.

Technical analysis:

- The failure to quantify the extent of important land uses that impact water quality, such as timber harvest, road densities, near-stream roads, and road-stream crossings.
- The failure to use all available tools to identify and manage risks to water quality. Use of the readily-available SHALSTAB shallow debris torrent model, for example, would enable the identification of erosion hazard areas that could then be used to evaluate the relationships among past watershed management activities and as a screen for guiding future watershed management decisions.

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- Remote-sensed vegetation data, including change scene detection data, should have been used to characterize forest health, growth and its relationship to cumulative watershed effects.
- The failure to spell out that peak flows in many watersheds within the Scott basin are unnaturally high due to land use impacts. Timber harvest and roads elevate the risk associated with rain-on-snow events and they increase peak flows, which, in turn, accelerate erosion and channel scouring which result in shallow, open streams that are then vulnerable to warming
- The lack of transparency of models and the data used in them is regrettable. All models and data utilized in the Scott TMDL should be available for public review. These datasets include all the GIS data (including roads, streams, and landslides), road surveys, temperature data, and macro-invertebrate data. In comments on the pre-draft, we requested access to these data so that we could evaluate them. Regional Water Board staff have sent only portions of the data, and have indicated that the rest of the data will be arrive later -- but have not yet delivered the missing data.

Implementation:

- Relies far too much on voluntary measures and needs to be strengthened to give dischargers more incentive to improve practices
- Failure to take necessary actions to ameliorate the impacts of water use on water quality.
- Failure to target essential coho salmon habitat and prioritize it for protection and restoration.
- While the technical analysis recognizes cottonwood gallery forest as the potential vegetation for valley riparian areas, the implementation chapter does not set forth a

plan that will allow restoration of a more natural sinuous channel with a connection to its floodplain; without such changes, full riparian restoration will likely be confounded.

- Relies too heavily on the State's Forest Practice Rules program, which has been scientifically demonstrated, to both the California State Board of Forestry and the Regional Water Board, to be inadequate to protect stream habitat needed for the recovery of at-risk Pacific salmon like coho salmon. Waste Discharge Requirements are mentioned as a tool, but the TMDL should provide guidance for how they can effectively used to set prudent limits on cumulative watershed effects risks by reducing road densities, road stream crossing density, and restricting the percent of watershed area that can be harvested.

Monitoring:

- The lack of a clear and specific monitoring plan that would help track the success of mitigation and restoration measures, and which would allow for cooperative adaptive management, including Tribal participation, as an element of the TMDL's implementation. The TMDL asserts that a monitoring plan will be developed later, but it would be better to formulate a preliminary plan now.

Spence et al. (1996) point out that aquatic habitat conditions are directly correlated to upland watershed health. The Scott TMDL needs to recognize that in order to restore aquatic habitat diversity capable of supporting species like coho salmon, watershed and riparian conditions need to trend more toward the natural range of variability of vegetative seral stage conditions and hydrologic functions.

The TMDL Action Plan will become an amendment to the North Coast Basin Plan (NCRWQCB, 2003). This will require that the Plan meet the standards of Section 13242 of the California Water Code concerning specific actions, their timing, and the Regional Water Board's responsibility for monitoring such actions and timelines necessary to achieve the water quality objectives that the State sets. The Tribe will be evaluating the final Scott TMDL closely to make sure that it describes mechanisms of degradation, methods of remediation, a timeline to reverse impairment, and clear monitoring steps to gauge the attainment of its water quality restoration objectives.

Additional data produced to support review and implementation of the Scott TMDL

Please review the linked ArcView project assembled by Kier Associates for support of review of the Scott River Sediment and Temperature TMDL on behalf of the Klamath Basin Tribal Water Quality Work Group.

http://www.krisweb.com/ftp/TMDL/scott_tmdl_gis_map_project.zip

These data have also been enfolded into the Klamath Resource Information System (KRIS) database for the Scott, taking advantage of the KRIS Map Viewer feature. Spatial data augment KRIS Version 3.0 and allow all Tribes, the North Coast Regional Water Quality Control Board staff, U.S. Environmental Protection Agency and others cooperating in development of the Scott River TMDL. Data may be used in revision of the Scott River Sediment and Temperature TMDL, but should also prove useful in the implementation phase.

Kier Associates, on behalf of the Klamath Basin Tribal Water Quality Working Group, also produced a SHALSTAB model run for the Scott River watershed, resulting in a map of predicted unstable areas in the watershed. Due to its file size, the SHALSTAB run is being distributed separately. It is available for download at:

http://www.krisweb.com/ftp/TMDL/ScottShalstab.zip

Chapter 1: Introduction

Watershed Restoration and Enhancement Efforts: Section 1.4 of the Scott TMDL lauds the success of Scott River restoration programs, but supplies no data other than that for French Creek to demonstrate benefits to water quality. The *Mid-term Evaluation of the Klamath River Basin Fisheries Restoration Program* (Kier Associates, 1999) is not referenced, although it provides a useful overview of the success of the projects and changes in habitat during the duration of the program efforts that began in 1985. The Scott TMDL needs to require that all data useful for evaluation of restoration projects be publicly shared and it needs to specifically define needed monitoring associated with current and future restoration projects, including organized photo points. Restoration and protective actions need to target those areas with the greatest existing aquatic and biological diversity as a priority (Bradbury et al., 1996).

1.5.6 Hydrology:
The following language was added to section 4.1.2.2, which addresses a pre-draft TMDL comment (QVIC 2005b) that aggradation can also contribute to diminished surface flow, "(Channel dewatering can also be affected by channel aggradation as a result of increased sediment loads.)"

The Hydrology section has discussions of ground water and its relationship to surface flows that would be improved if the effects of wells were included. (for additional comments on groundwater and wells, see section 4.1.2.2 and 5.1.8.2 below)

Chapter 2: Problem Statement

2.3.1 Salmonid Populations
The final Scott TMDL needs to explicitly recognize what is known about coho salmon in the Scott River basin as recommended in early comments by QVIC (2004, 2005b). We suggest that the following language be added to the end of the second paragraph on page 2-5 (after "… no population estimates were made from this information): "In recent years, many surveys have been conducted to identify locations where coho salmon spawn (Quigley, 2005, Maurer, 2002; Maurer, 2003; SRCD, 2004). These data provide clear indication of a difference in strength between year-classes (two are weak and one is strong), and that all three brood years are showing positive trends (SRCD, 2005). CDFG (2004) and others have

produced detailed maps of coho salmon distribution within the Scott River watershed (Figure 1).

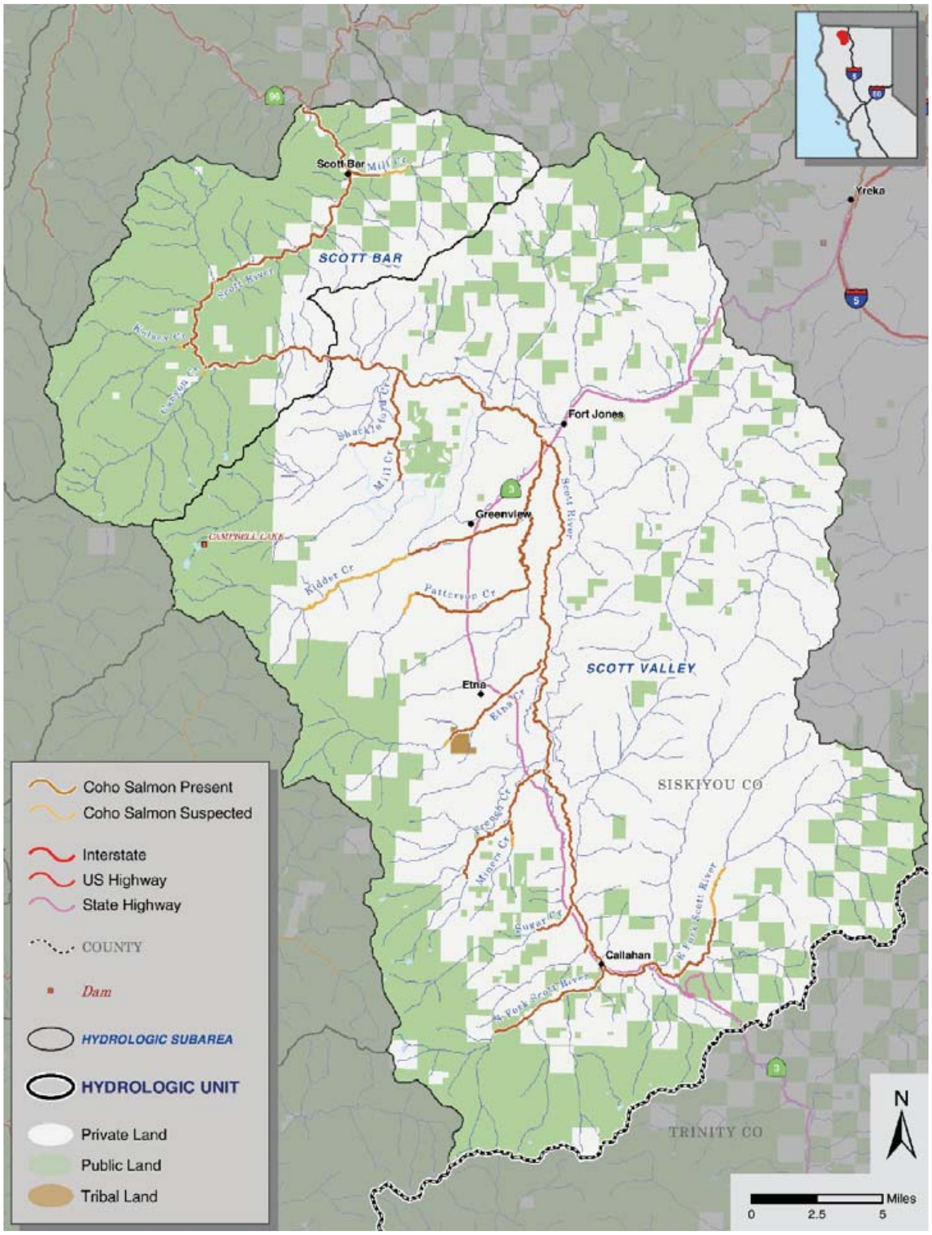

Figure 1. Suspected and confirmed range of coho salmon in the Scott River watershed. From CDFG (2004).

The risk of coho stock loss is high when there are very weak year classes (Rieman et al., 1993; CDFG, 2004). The Final Scott TMDLs in the Scott River basin need to recognize that aquatic habitat problems must be resolved or, at least, showing major recovery trends by 2015-2020, when ocean conditions are likely to enter a period of poor survival for salmon due to the Pacific Decadal Oscillation (Collison et al., 2003).

While the Scott River TMDL posted a chart of fall chinook salmon trends, it did not discuss the fact that the 2004 adult return was the lowest of all time. The South Fork Trinity TMDL

(U.S. EPA, 1998c) has goals for recovery of fall and spring chinook populations and the final Scott TMDL should advance similar biological targets. Kier Associates (1999) point out that egg survival of fall chinook spawning in the Scott River canyon may be low due to the potential for intrusion of sand into redds. The final Scott TMDL needs to recognize the basin's pattern of use by fall chinook and specifically address the abatement of sediment problems in the canyon where California Department of Fish and Game data show they spawn (Figure 2).

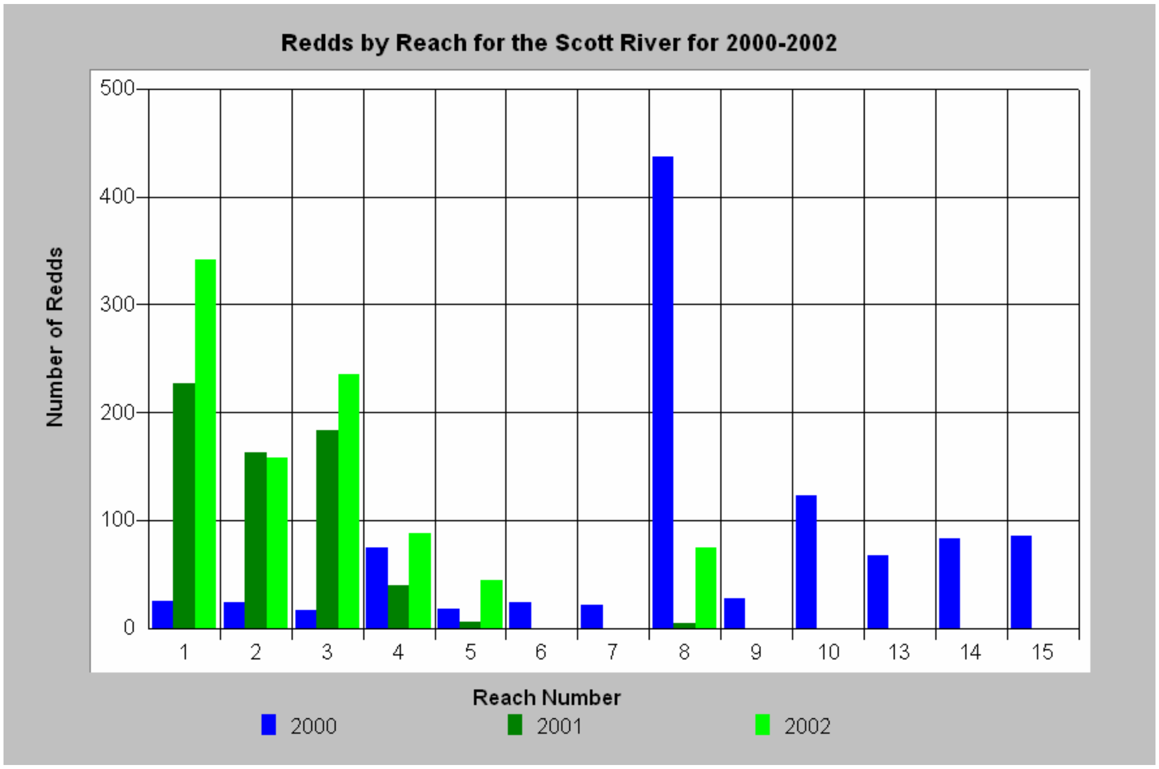

Figure 2. Data from CDFG spawner surveys show that fall chinook salmon spawned mostly in the lowest five reaches of the Scott River in 2001 and 2002, where eggs may be vulnerable due to high bed load of decomposed granitic sands.

The Scott TMDL should recognize also that spring chinook and summer steelhead recovery may be attainable, due to metapopulation function (Rieman et al., 1993), if coldwater refugia are restored in the lower Scott River, sediment burdens diminished, and stream flows improved.

<u>2.4 Sediment Problem Statement</u>: The Scott TMDL Problem Statement should specifically recognize the processes that are causing pollution and the linkages between human activities and water quality impairment. While the origin and mechanisms of water quality problems in the Scott River are well documented (Kier Associates, 1991; 1999; CH2M Hill, 1985), the problem statement describes these relationships only vaguely.

Section 2.4 of the Scott TMDL avoids clear discussion of major topics that must be addressed honestly if sediment pollution is to be abated: 1) road densities and crossings need to be quantified and limits set to reduce the risk they represent for sediment pollution and damaging peak flows, 2) timber harvests and their links to cumulative watershed effects

must be described and disturbance limits set, 3) forest growth needs to be assessed to confirm the assumptions made concerning watershed recovery to background levels for sediment yield and natural hydrologic function, and 4) unstable areas need clear identification so that activities on these areas can be limited.

<u>2.4.1.2 Sediment Desired Conditions and 2.4.3 Watershed Sediment Conditions in the Scott River Watershed</u>

Our comments on these sections are combined. See below for details on each topic.

<u>Road Densities and Road Effects</u>
The issues raised by Kier Associates (2004, 2005a, 2005b) regarding road density have not addressed in the draft Scott TMDL. While recognizing that problems are sometimes associated with roads, there is no target or threshold set to remedy impairment. Although the Scott TMDL mentions road density limits of 2.5 mi. /sq. mi. set by Armentrout et al. (1999) for those Lassen National Forest streams which harbor anadromous salmonids, it fails to set a similar standard**:** "The Scott River TMDL Action Plan does not propose road density as a specific desired condition for the Scott River watershed, although a decreasing trend in road densities would be beneficial." This is only one of many areas where there is no enforceable, follow-up action to assure the abatement of water quality problems. <u>A target for road densities of less than 2.5 mi./sq. mi should be included in Table 2.4</u>.

Cedarholm et al. (1981) found a direct correlation between road densities and increases in fine sediment harmful to salmonid spawning in streams. The U.S. Forest Service (1996) compared data for bull trout and other salmonid species with road densities over 3,000 interior Columbia River basin watersheds. They concluded that**:** "the higher the road density, the lower the proportion of sub-watersheds that support strong populations of key salmonids" and that bull trout were absent from watersheds with more than 1.7 mi. /sq. mi. of watershed area. They also found a relationship between fine sediment in streams and road density. The USFS (1996) road density classification is shown as Figure 3. The National Marine Fisheries Service (1996) has required that road mileage be reduced in USFS and BLM lands in the interior Columbia River basin with an emphasis on "road closure, obliteration, and revegetation" where road densities exceed 2 mi. /sq. mi. on.

Roads are known to cause higher erosion on unstable rock types, such as decomposed granite (DG), in the Scott River basin (Sommarstrom et al., 1990). Consequently road density targets for sub-basins with DG need lower targets than 2.5 miles per square mile. Sommarstrom et al. (1990) found that road densities were already 3.7 miles per square mile in the Scott's DG areas in 1990. The only analysis of road density in the Scott TMDL is in Table 3.3, where densities are amalgamated into TMDL sub-basins, which may ignore extremely high localized road conditions, such as the 8.9 mi./sq. mi. of roads on private industrial timber land in Shackleford and Mill Creeks (SHN, 1999).

The VESTRA-developed GIS layer of roads used by the RWB for its TMDL under-represents roads and skid trails in some areas of the Scott watershed (Figure 4). Only major haul roads are included, which means that many temporary roads and skid roads that can increase erosion remain unaccounted. This should be noted under margins of safety in 3.5.4.

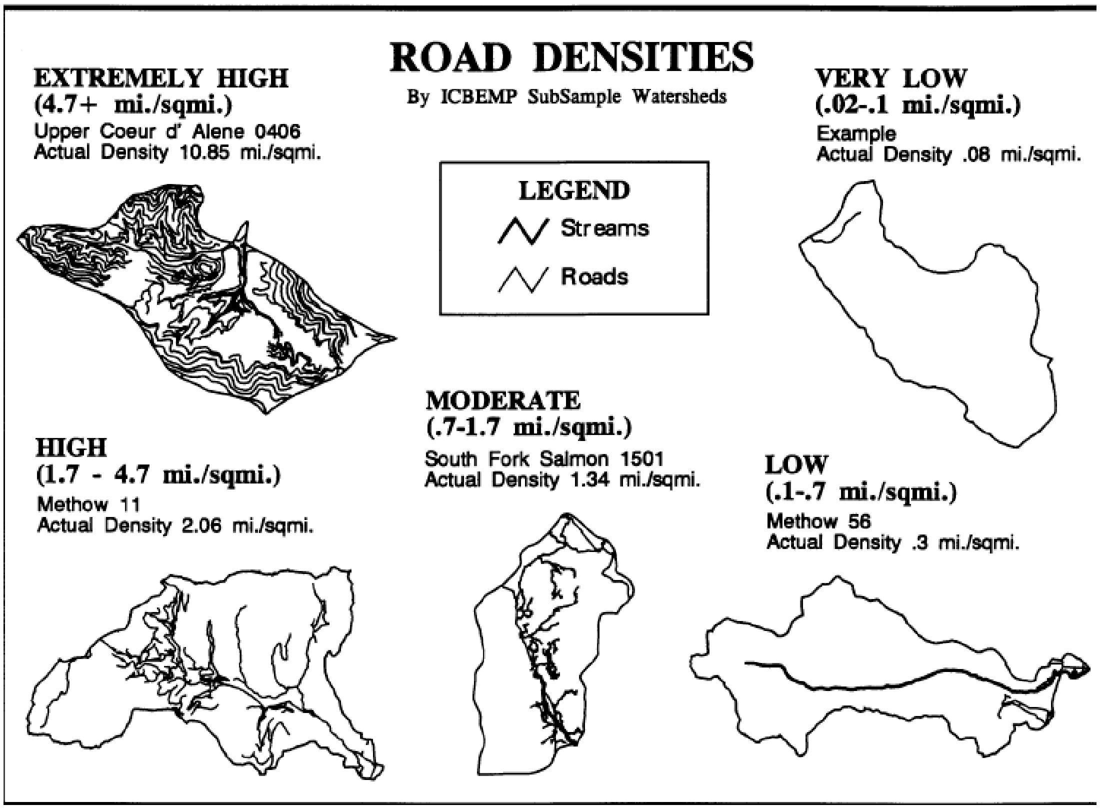

Figure 3. This figure shows the road density classification for the Interior Columbia River basin that is recognized by the USFS (1996) in relationship to maintaining aquatic biodiversity.

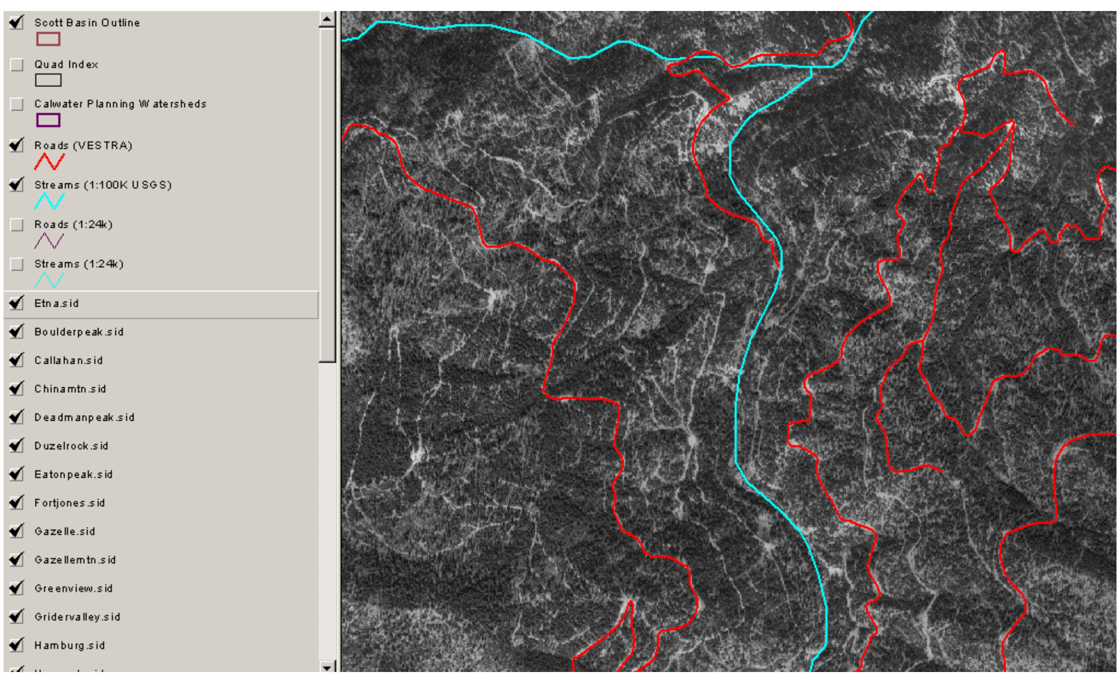

Figure 4. This map is of the upper Patterson Creek drainage and shows mapped roads in red, but USGS orthophotos also displayed show many more roads than are mapped.

The final Scott TMDL should provide a table of road densities by Calwater Planning Watershed. There are 68 Calwater Planning Watersheds in the Scott River basin. A chart should be made for each of the sub-basins where there is high road densities associated with land management. These charts and tables could be easily made from existing data by a capable GIS analyst, of which the RWB has several. In the sediment source analysis for the mainstem Trinity River (Graham Matthews and Associates, 2001), table 37 (page 127) were presented showing road lengths, drainage area, and road densities. An example of a chart made from such data by Graham Matthews and Associates (2001) may be seen at http://www.krisweb.com/krisklamthtrinity/krisdb/webbuilder/nt_c17.htm

A major reason that Scott River basin road densities need to be reduced is that they can alter the hydrology of the watershed as described by Jones and Grant (1996). Roads that cut into hillsides often disrupt sub-surface drainage increasing peak flows during storm events and decreasing ground water recharge that supports summer base flows. Increased peak discharge can also simplify channels, wash away large woody debris, fill pools and cause bank erosion (Montgomery and Buffington, 1993). Without reducing road densities and restoring natural hydrology, natural flow regimes with which salmon co-evolved cannot be restored.

<u>Stream Crossings with Diversion- or Significant Failure Potential</u>

Section 2.4.3.1 of the Scott TMDL deals with the potential for failure at road crossings, but fails to note that some stream crossings in steep areas may cross the paths of debris torrents. The USFS replaced culverts with concrete fords in such high-risk areas of high in the lower Scott River (Kier Associates, 1999). The Klamath National Forest (KNF) study of the 1997 flood (de la Fuente and Elder, 1998) indicated that channel scour in many tributaries was caused by multiple culvert failures at different locations on the same stream. In a study of Sierra streams, Armentrout et al. (1998) recommended that stream crossings be limited to less than 2 per mile of stream to prevent catastrophic failure of "stacked culverts." The TMDL should limit the number of stream crossings and recommend that the USFS method of changing crossing types in high-risk locations be carried out on private land as well. <u>A target of less than 2 crossings per mile of stream in high-risk areas should be added to Table 2.4</u>.

Information should be included in this section from Klamath National Forest data collected as part of the de la Fuente and Elder (1998). The KNF coverage "damage_all" contains information from Emergency Relief Federally Owned (ERFO) Damage Site Reports from the 1997 post-flood field assessments by Forest Engineering. Joining that coverage with its lookup table "all_lut.xls" allows for the viewing of flood damage sites by type. Of the 39 sites identified in the Scott River watershed, 29 were road/stream crossing failures (type "S" in lookup table). It is unknown how many road-stream crossings were surveyed, but the failure rate is likely higher than the TMDL target of 1% of crossings failing in a 100-yr return interval storm, given that the 1997 storm was only a 14-year return interval storm.

<u>Hydrologic Connectivity</u>

The Scott TMDL discussion on Hydrologic Connectivity (in 2.4.1.2) makes assumptions with regard to road-related projects on timberlands that may not be supported. For example, it implies that roads can be hydrologically disconnected and that impacts from roads can be fully mitigated without reducing road densities. A RWB commissioned study by an independent science review panel on coastal streams (Collison et al., 2003) indicated that similar assertions made by Pacific Lumber Company in their watershed analyses (PL, 2002) were unfounded. Collison et al. (2003) noted that "storm-proofing and road upgrading are suggested in the prescriptions to overcome excess sediment production; however, no data have been presented that demonstrates the effectiveness of these programs." Upgrading roads can reduce but not eliminate hydrologic and sediment impacts. Even if roads are well-built and maintained, dense road networks can still cause problems due simply to the sheer number of road miles. If the Scott TMDL applies assumptions related to roads and erosion, the Implementation Plan should require a validation of such assumptions, both with respect to sediment yield and changes in hydrology.

<u>Annual Road Inspection and Correction</u>
Section 2.4.3.3 of the TMDL recognizes the need to inspect roads at least annually and to correct problems promptly when they occur, but it fails to include any enforceable language to meet that objective. The KNF has approximately three times more road miles than can be annually inspected and actively maintained (de la Fuente and Elder, 1998). This suggests that the KNF road network needs to be substantially reduced if road-related erosion is to be controlled. The Redwood Creek TMDL (U.S. EPA, 1998) specifies that "All roads are inspected and maintained annually or decommissioned" and that "Roads that are closed, abandoned, or obliterated are hydrologically maintenance free." The road network in the Scott River basin is well beyond that which can be maintained, and a similar requirement to that in the Redwood Creek TMDL is needed for the Scott TMDL.

<u>Activity in Unstable Areas</u>
There is no specific discussion of disturbance of chronically unstable areas by timber harvest or road building in the Scott TMDL: "analysis of activities in unstable areas was not conducted for this report." The document recognizes that the shallow landslide stability (SHALSTAB) model can be used to successfully predict "chronic risk areas including steep slopes, inner gorges, and headwall swales" (Dietrich et al., 1998) and it also notes the increased failure risk associated with inner gorge locations (Graham Matthews and Associates, 2001). Kier Associates (Derksen, 2005) used 10 meter USGS DEM data to run the SHALSTAB model for the Scott River watershed and has provided that data to RWB staff for use in drafting the final Scott TMDL (Figure 5). This reconnaissance-level activity showed a high correlation between high-risk areas for shallow landslides and those landslides actually mapped by the USFS (de la Fuente and Elder, 1998).

We recommend that the RWB and other use SHALSTAB as a preliminary screen, not necessarily as the ultimate decision tool, to identify unstable areas requiring protection in the Scott TMDL. If actions are proposed in the identified areas, then an on-the-ground survey by a geologist could provide field-based information to supplement the SHALSTAB model.

<u>SHALSTAB maps should be included in Section 2.4.3.6 of the TMDL, and should also be made available electronically in a GIS format</u>. The SHALSTAB maps should also be used in GIS analyses to quantify the percentage of the predicted unstable areas that have been disturbed in each Calwater Planning Watershed.

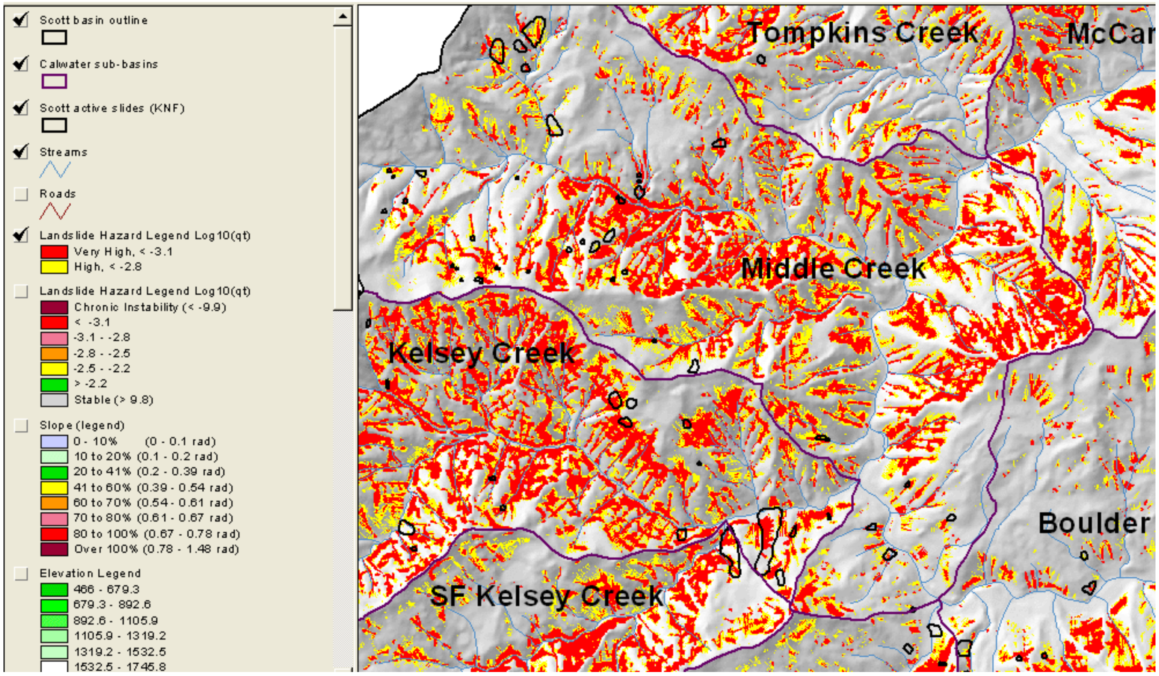

Figure 5. This map is taken from an ArcView project by Derksen (2005) and shows that the risk of shallow debris torrents in the lower Scott River is high and that the large majority of landslides mapped by Klamath National Forest scientists occurred on areas shown here as high risk.

<u>Disturbed Areas</u>

While Section 2.4.3.5 of the Draft TMDL is correct in stating that the there no information or analysis "sufficient to identify a threshold below which effects on the Scott River watershed would be insignificant", it would still be valuable to use existing data to calculate disturbed areas. Timber harvest data are available for all periods from the Klamath National Forest, but only between 1991 and 2001 on private land from CDF. Similar to the road density and road location maps requested above, <u>we recommend that the RWB include TMDL tables and charts of the percentage of each Calwater Planning Watershed that has been timber harvested over the period of available data, and include them in section 2.4.3.5</u>.

There is no indication there was any serious effort by the TMDL authors to quantify timber harvest, except generally under "activities", on unstable lands even though timber harvest has been linked to sediment production and changes in hydrology by recent northern California studies conducted for the State, including for the RWB itself (Ligon et al, 1999; Dunne et al, 2001; Collison et al., 2003). Reeves et al. (1993) suggest that a maximum of 25% of a watershed should be harvested in 30 years in order to maintain diverse assemblages of Pacific salmon. Ligon et al. (1999) pointed out that the lack of quantification and limits on timber harvest was confounding efforts to control watershed impacts and protect Pacific salmon in California.

Sommarstrom et al. (1990) indicated that "39% of the granitic area has been harvested, not including site re-entries, based on data from 1958-1988 for public lands and 1974-present for private lands." Decomposed granitic soils are notoriously xeric after timber harvest and the regeneration of forest vegetation can be slow (TCRCD, 1998). Consequently, timber harvests not mapped by the RWB and its staff that occurred between the late 1970s and 1992 may still be contributing to cumulative watershed effects, including sediment yield.

<u>Analysis of Cumulative Watershed Effects</u>

The RWB staff should be using remote sensing data for reconnaissance and analysis, such as change scene detection, to understand the patterns of landscape disturbance and forest growth and to build that knowledge into the TMDL. Change scene detection involves the use of a series of Landsat scenes from different years in order to compare patterns in landscape change over a given period (Levien et al., 2002). The necessary data are available from the California Department of Forestry (CDF) and U.S. Forest Service Spatial Analysis Lab in Sacramento for the period 1994-1998.

Figure 6 shows a summary of change scene data from 40 of the 68 Scott River Calwater Planning Watersheds sorted by the highest level of disturbance. Areas with the highest rates of recent disturbance have the greatest risk of CWE and should be studied as a priority and called out as a concern. The northeastern and northwestern parts of the Scott Valley (the West Canyon and East Canyon sub-basins) watersheds had the highest change in vegetation owing to the high rates of timber harvest on both private and USFS lands. Patterns of disturbance include sensitive headwaters areas, inner gorge locations, and riparian zones (Figures 7 and 8).

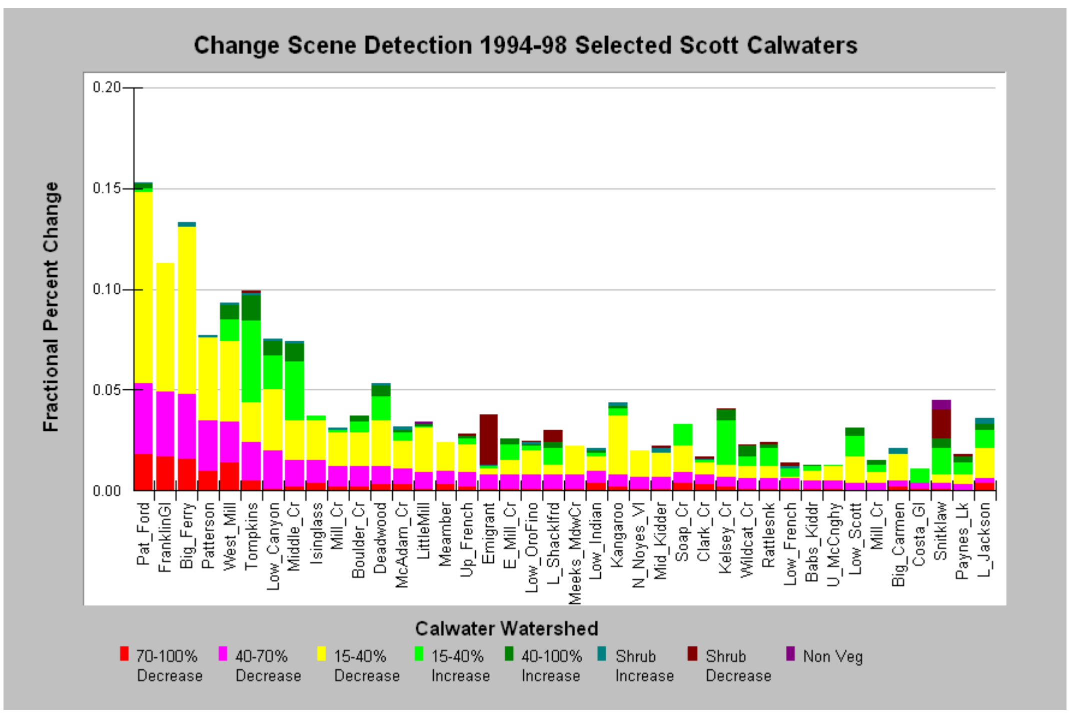

Figure 6. This chart shows change scene detection for 40 Calwater Planning Watersheds in the Scott River basin based on USFS and CDF interpretation of Landsat scenes from 1994 and 1998.

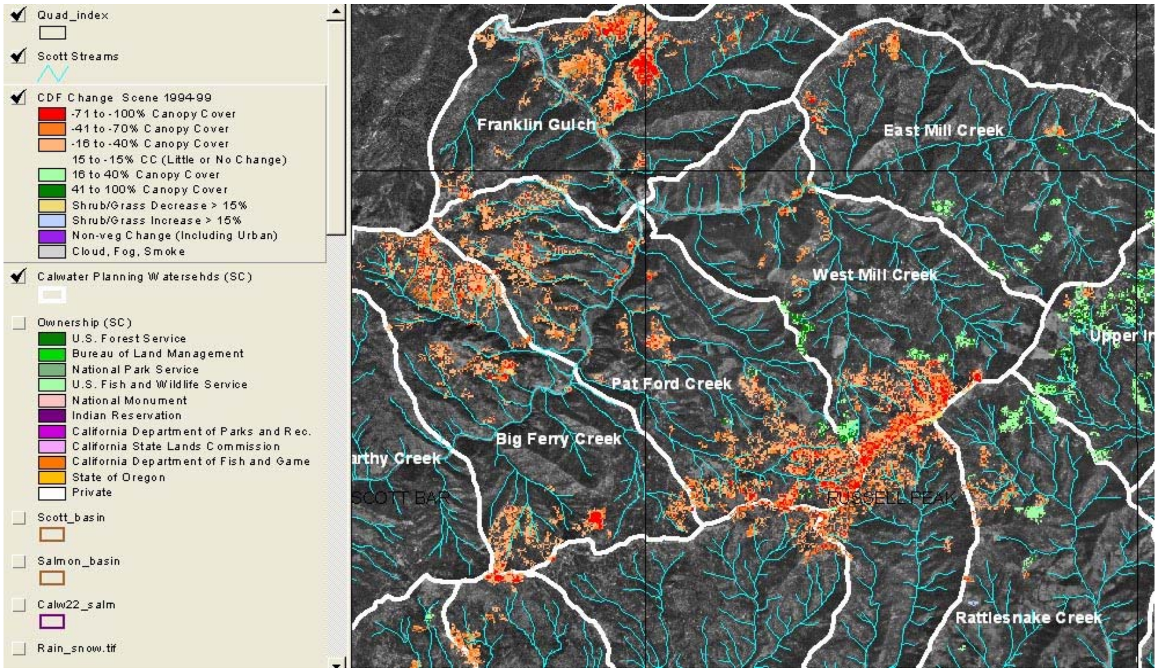

Figure 7. Landsat change scene detection from 1994-1998 shows major canopy reduction.

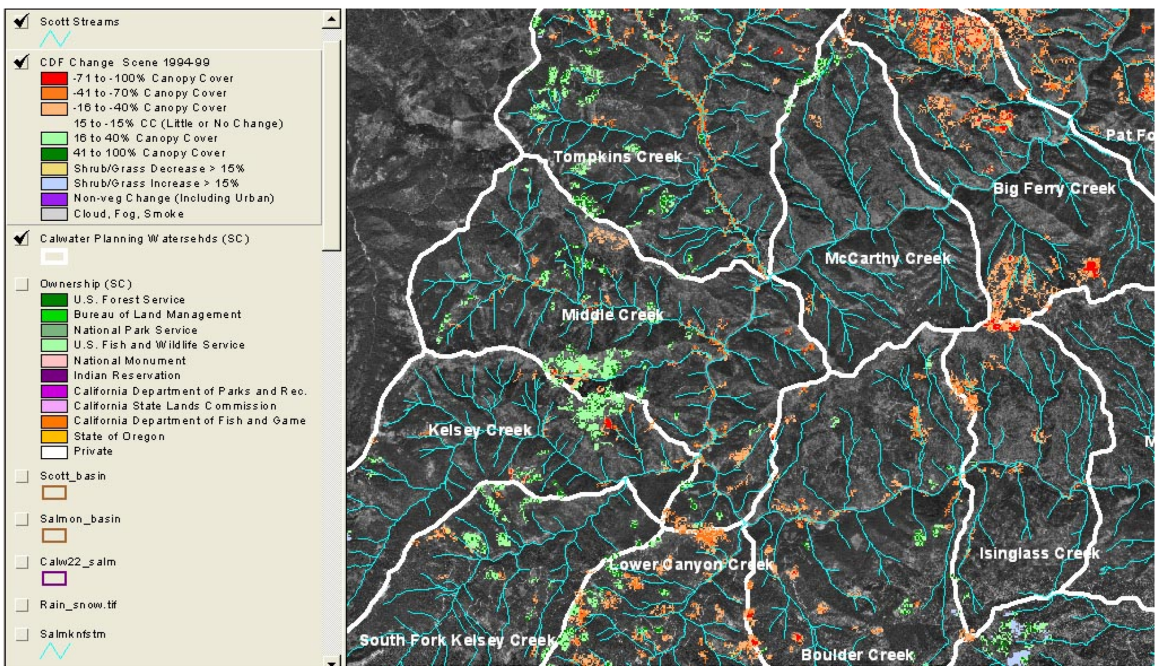

Figure 8. Change scene detection from 1994 and 1998 Landsat images for West Canyon sub-basin areas shows forest canopy reduction from logging (orange and red) and forest regrowth (green) where trees are growing back in areas formerly harvested or burned.

The West Canyon (northwestern area of Scott watershed) is largely owned and managed by the U.S. Forest Service, but timber harvest activity is widespread (Figures 7 and 8). While canopy reduction shows areas recently harvested, it shows tracks of debris torrents and channel scour as linear patterns bordering Tomkins Gulch and lower Middle and Kelsey

Creeks. The channel-resetting debris torrents caused by the January 1997 storm were a very high level of impact for a 14-35 year return interval event (de la Fuente and Elder, 1998). Patterns of disturbance indicated that roads, clear cuts, and previous fires tended to elevate contributions of sediment (Figure 7) and those failures often occurred in the rain on snow zone. Green polygons displayed in change scene data indicate growth in areas that were logged previously or disturbed by fire in the 1980's. Forest recovery after logging in this geographic area is good because it is the wettest portion of the Scott River basin, but regeneration in more arid sub-basin areas appears much lower.

Although the TMDL did not identify impacts from landslides and sediment to the East Fork Scott River sub-basin, the East Fork experienced channel scour and flood damage as a result of the January 1997 storm event (Kier Associates, 1999). Timber harvest was high during the period of 1994-1998 on public and private land in some areas that are likely subject to rain-on-snow events in this sub-basin (Figure 8). Patterns of disturbance in transient snow zone and linkage to increased peak flow and channel scour of the East Fork need to be explored. Lack of tree growth in areas previously harvested may cause a window of extended risk for rain-on-snow events (Figure 9). Patterns of road failures from de la Fuente and Elder (1998) are similar to other areas in the transient snow zone. These patterns likely extended to private timber lands in the Westside TMDL sub-basin but lack of access to private lands prevented appropriate assessment by RWB staff.

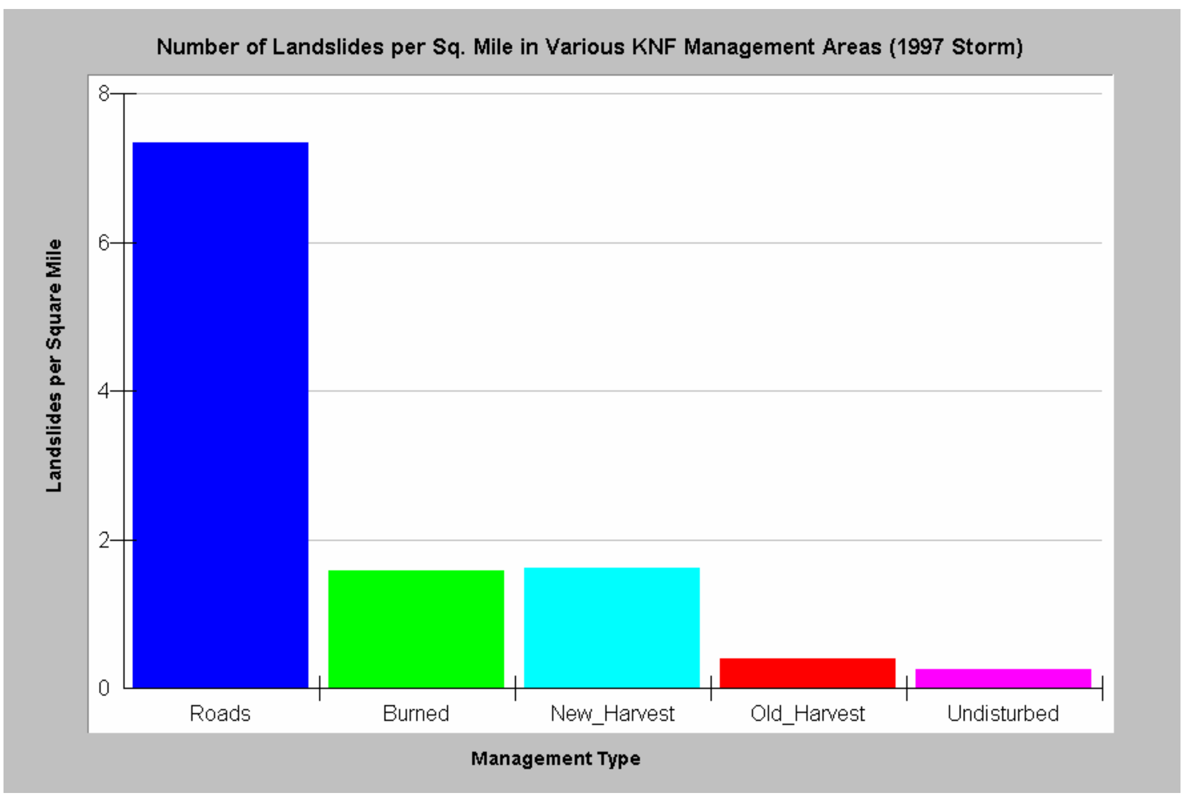

Figure 9. This summary chart is based on data from de la Fuente and Elder (1998) regarding 1997 flood effects and shows few landslides occurred on undisturbed lands of the Klamath National Forest, and slide frequency was associated with human disturbance.

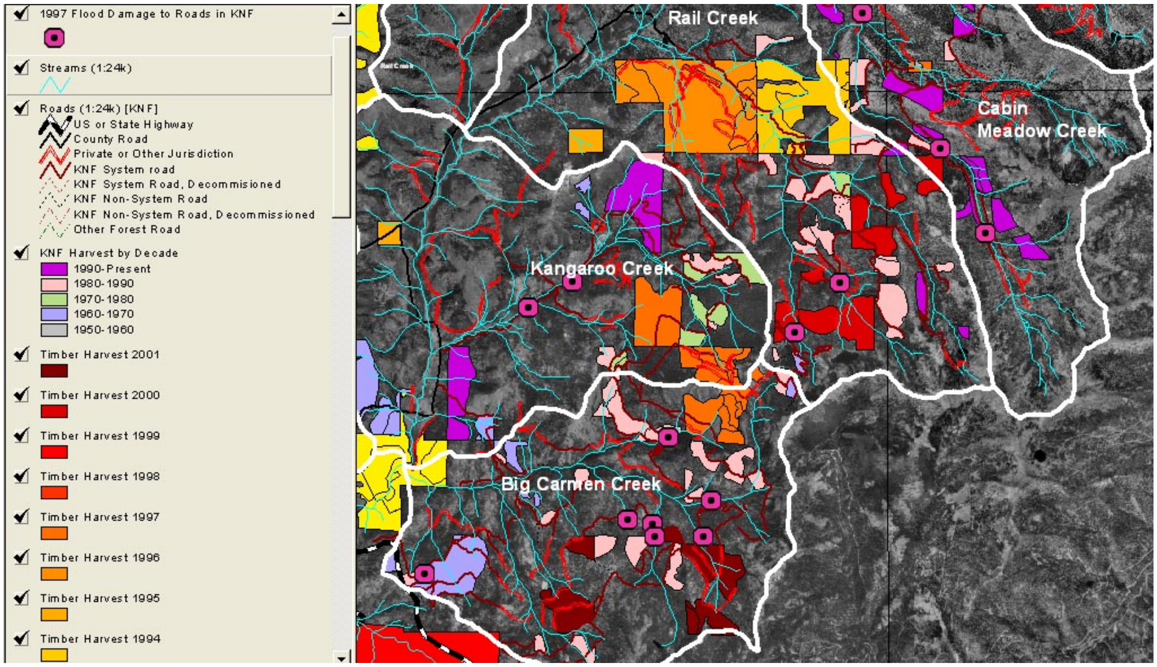

Figure 10. Several East Fork Scott River Calwater Planning Watersheds are shown here with timber harvests, roads and 1997 flood damage sites indicating cumulative effects. Lands include a mix of private and USFS ownership. Data are from the USFS and CDF. Discussion below.

Berris and Harr (1987) and Coffin and Harr (1991) found that old forests trap snow in the canopy and return moisture directly to the atmosphere as a result of ablation. They found that snowfall in a heavily managed or clear-cut forest tends to build up in a snow pack that is less subject to ablation. Consequently peak flows in the transient snow zone may be increased over normal by rain-on-snow events.

Figure 8 shows change scene data for 1994-1998 in the East Headwater TMDL sub-basin with extensive timber harvest, but little forest re-growth. Figures 9 shows Klamath National Forest timber harvests by decade in the Kangaroo Creek and Big Carmen Calwater Planning Watersheds, followed by remote sensing vegetation data in the same area (Figure 10). Comparing the two maps shows that there was little or no re-growth after timber harvest in the 1980s with the polygons of previously logged areas showing up clearly as Non-Forest or Saplings. This indicates problems with forest regeneration. Such stunting would lead to increased and continuing risk of damaging flows due to rain-on-snow events.

<u>A map of the transient snow zone (Figure 11) needs to be added to the Scott TMDL as well as a discussion of increased peak flow, channel scour and resulting increased water temperature</u>. The rain-on-snow zone information provided by Kier Associates is based on Armentrout et al. (1999) and recognizes 3,500 to 5,000 feet in elevation as the area of greatest risk. In order to truly remediate problems as required by law, the TMDL should call for reduced road densities and timber harvest, especially in the transient snow zone.

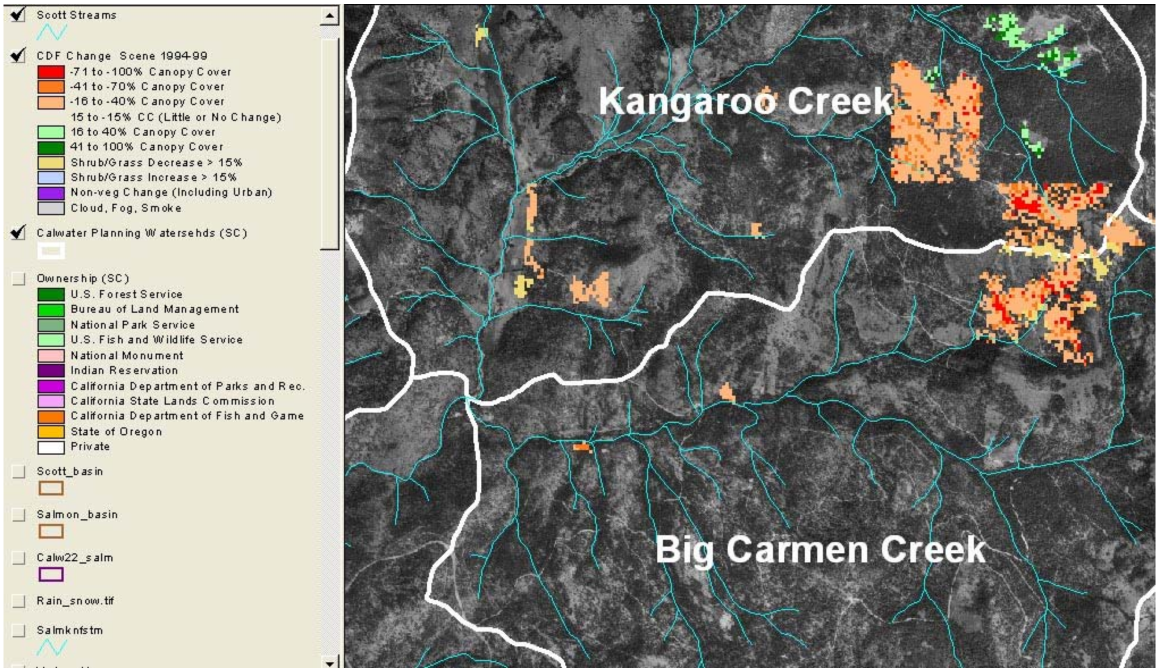

Figure 11. Change scene detection from the USFS and CDF (1994-1998) in East Headwater TMDL basin shows decrease in canopy due to timber harvest, but little forest growth (green). Note that Big Carmen Calwater has widespread indication of earlier logging, sparse tree cover, but no signs of canopy increase.

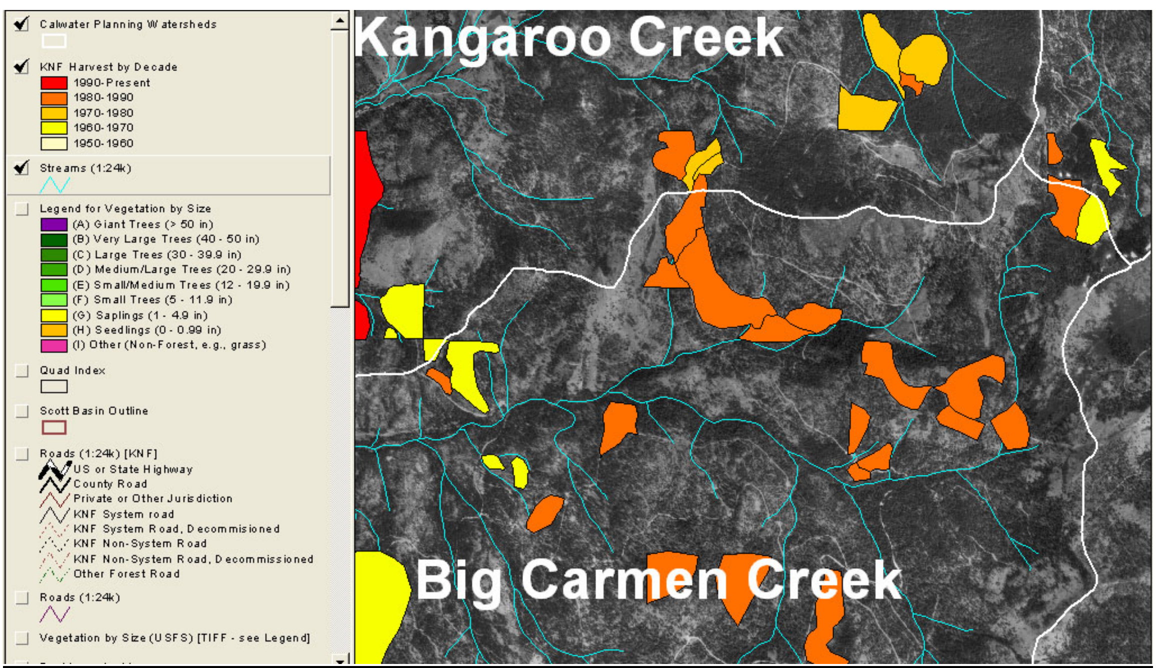

Figure 12. Klamath National Forest timber harvests by decade are displayed for parts of the East Fork Scott in the Kangaroo and Big Carmen Creek Calwater Planning Watersheds. Note the shape of polygons of timber harvest in the 1980s for comparison with Figure 9.

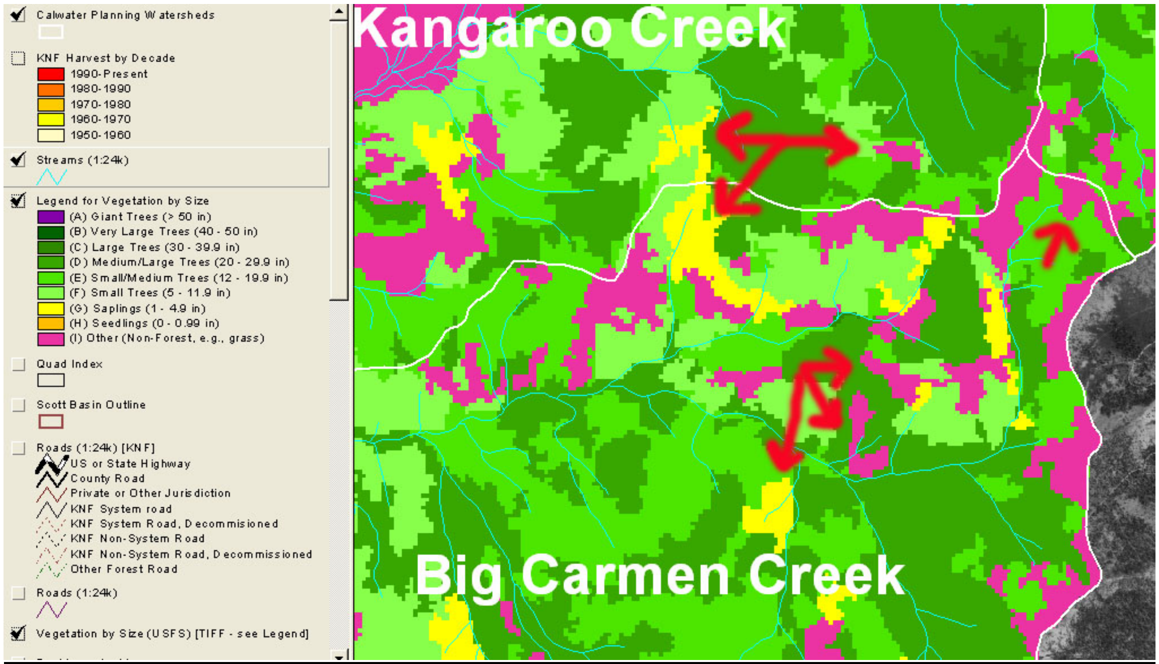

Figure 13. This map of vegetation and tree size is derived from a 1998 Landsat image and shows the same geographic extent as Figure 8. Note that polygons from previous harvest in the 1980s are clearly visible as Non-Forest and Saplings (red arrows point out), indicating extremely slow vegetation growth, which extends the duration of cumulative effects risk of increased flows, especially since this area is in the rain-on-snow events zone.

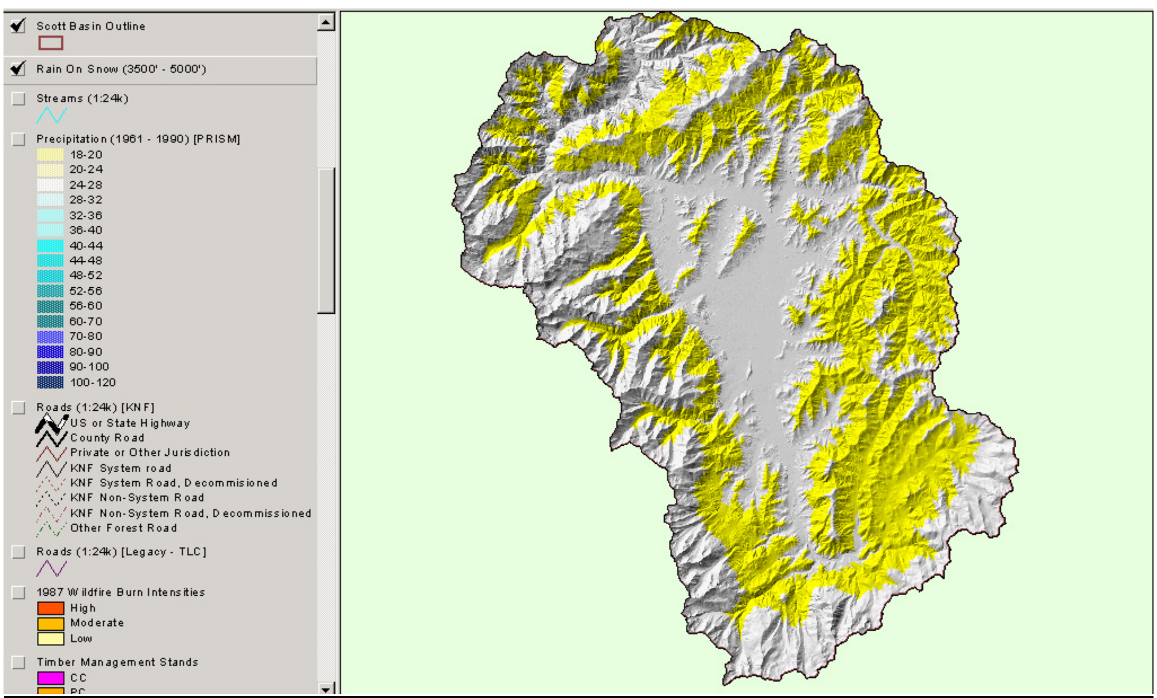

Figure 14. This map shows a band of elevation from 3500 feet to 5000 feet to represent the transient snow zone in the Scott River basin following the convention of Armentrout et al. (1999).

2.4.2 In Stream Sediment Conditions: Table 2.2 in section 2.4.1.1 of the Draft Scott River TMDL partially remedies deficiencies pointed out in pre-draft TMDL comments (Kier Associates, 2005b) by including reference targets for some instream conditions. While many targets are those adopted by previous TMDL processes (U.S. EPA, 1998a; 2001), several found in other north coast studies have been overlooked. The following parameters should be added to Table 2.2: cross-sections, median particle size distribution, volume of sediment in pools (V*), turbidity, mainstem pool depths, and tributary pool depths (see details below). The RWB staff acquired a great deal of data related to channel conditions for the Scott TMDL, but useful summaries (i.e. charts or tables) for most of the datasets are missing from the document.

2.4.2.1 Benthic Macroinvertebrate Assemblages: The Scott TMDL sets target conditions using the Russian River Index of Biotic Integrity (IBI) for comparison. Although the IBI was derived without control streams as part of sampling regimes, values seen in Table 3.2 seem similar to those used nationally to describe healthy streams (Barbour et al., 1999; Barbour and Hill, 2003). The use of the IBI index score of 18 is appropriate, but the EPT Index, Percent Dominance Index and Richness targets in Table 3.2 should also be applied.

2.4.2.2 Riffle Embeddedness: While riffle embeddedness is one measure of suitability for salmonid spawning, it is more subjective than fine sediment measurements. The USFS survey data acquired by the RWB for the Scott TMDL were not provided with any metadata, so it is not known whether all reaches measured were of the same gradient or if channel confinement varied between sites. Habitat typing data for the Scott River basin should have been acquired and queries run for embeddedness so that in-stream conditions could be compared between watersheds with varying upland conditions. (See chart example at http://www.krisweb.com/kristenmile/krisdb/webbuilder/bw_c15.htm)

2.4.2.3 Large Woody Debris: Because there are no data regarding large wood in streams, discussion of its abundance and distribution are lacking in the Scott TMDL. This is a substantial problem because of the importance to coho salmon of pools formed by large wood (Reeves et al., 1988) and because large woody debris may be linked to downwelling and improved local water temperature conditions (Poole and Berman, 2001). Change scene detection shows extensive timber harvest in riparian zones (see Temperature section below). Reeves et al. (1993) found that timber harvest reduced large wood supply to streams, which compromised habitat diversity and caused loss of Pacific salmon species diversity. McHenry et al. (1998) described major reduction of large wood in Olympic Peninsula streams and noted that time required for re-growth of trees large enough to assist aquatic habitat complexity could require over 100 years.

Large wood delivery in steep, headwater swales is largely a result of landslides. If areas with high risk of debris sliding are harvested, the rate of failure increases as a result of loss of root strength (Ziemer, 1981), but large wood that would help meter sediment can be greatly reduced (PWA, 1998). The Scott TMDL needs to follow the guidance of Dunne et al. (2001) and use the best available tools, including remote sensing data and models to examine the relationship of timber harvest and large wood recruitment, particularly in tributaries that are known to be critical habitat for juvenile coho salmon rearing. The final TMDL should specifically describe problems with timber harvest in riparian zones in or above reaches inhabited by coho salmon so that large wood recruitment can be protected as part of waste discharge requirements under the timber harvest planning process.

2.4.2.4 Pool Distribution and Depth Conditions: Based on comments submitted on the pre-draft, staff added information on pool distribution and depth conditions to the TMDL. These data further confirm sediment impairment in the Scott River watershed. If RWB staff have habitat typing data in electronic form, then summary charts of pool frequency and depth should be constructed similar to one for the Ten Mile River (IFR, 2001) (see http://www.krisweb.com/kristenmile/krisdb/webbuilder/bw_c16.htm). The Redwood Creek TMDL (U.S. EPA, 1998b) specifies that pool depths in streams larger than 3rd order in size have pools at least 1-1.5 meters in depth, which should be applied to Scott River tributaries. Targets for mainstem Scott River pool depth should be set based on historic accounts and should be at least ten feet based on watershed size.

2.4.2.5 Percent Fines Conditions: The Scott TMDL should avoid making references that upper limits, such as 30% fines < 6.4mm, are fully acceptable. Kondolf (2000) showed that this is a level where 50% mortality of salmonid eggs can be expected. Fine sediment data from Lester (1999) for lower Scott River tributaries should be listed in a table and reaches where study was conducted shown on a map.

Discussions of sediment trends as measured by Sommarstrom et al. (1990) and Sommarstrom (2001) need to acknowledge that pollution from sand sized sediment is increasing at most locations, not decreasing (Figure 12). The extremely high fine sediment levels at mainstem Scott River locations indicate that there is still a substantial over-supply, although French Creek and Etna Creek sediment less than 6.4 mm decreased.

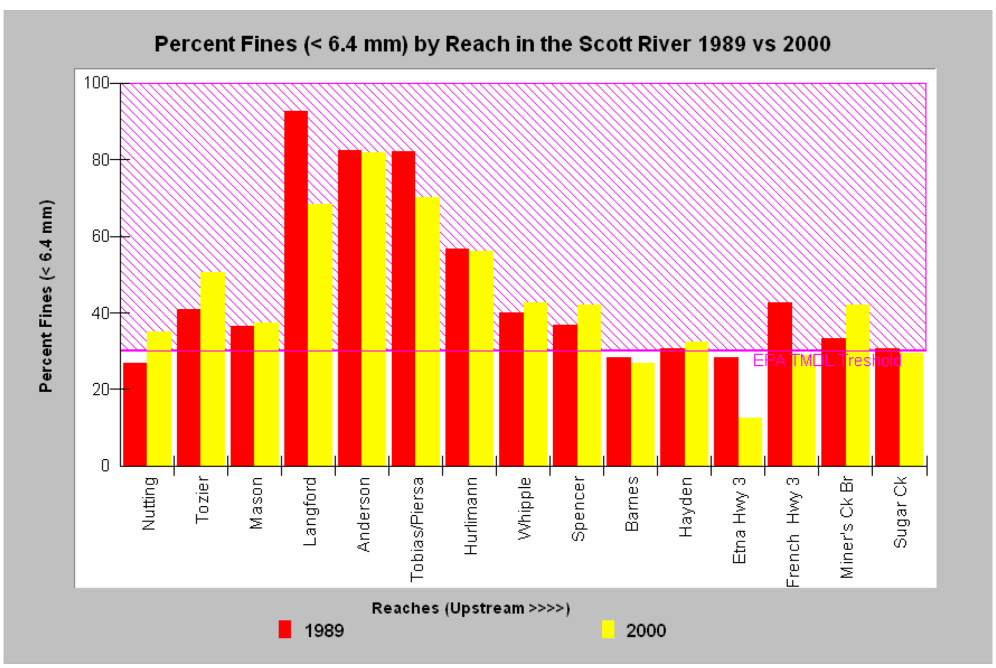

Figure 15. Summary chart showing fine sediment less than 6.4 mm at 11 mainstem Scott River locations and at four tributary locations.

Cross Sections and Longitudinal Profiles: The Scott TMDL does not deal with fine sediment transport and habitat impairment in the lower Scott River, where no data were collected by Sommartstrom et al. (1990). The results of fine sediment (<6.4 mm) indicate a continuing supply of sand to the Scott River. The high amount of sand in the valley is transported through the lower Scott River Canyon (Figure 13) where the highest annual fall chinook spawning takes place. Long term trends in sand supply and bedload transport are needed to see whether the requirements of fall chinook salmon are improving. The TMDL needs to provide a mechanism for measuring impairment and trends toward recovery.

Volume of Sediment in Pools (V*): The volume of fine sediment in pools relative to water and fine sediment combined or V* (Lisle and Hilton, 1992) has been used in French Creek in the Scott River watershed to show decreased sediment supply in response to road related restoration. Discussions of V* data in the Scott River watershed in section 2.4.2.7 are good but the V* should also be included in Table 2.2, with a target value of <0.10.

Median Particle Size Distribution: The work of Knopp (1993) also justifies the use of a target for a minimum median particle size distribution of 37 mm. Median particle size may also become very large in response to increased peak flows related to rain on snow events (Montgomery and Buffington, 1993). An upper limit for salmonid suitability should be adopted into the final Scott TMDL based on U.S. Forest Service studies (Gallo, 2002). Reynolds (2001) used median particle size with an upper limit of 90 mm for optimal size for salmonids and 128 mm as fully unsuitable in the Ecosystem Management Decision Support (EMDS) model.

Turbidity: The relationship between turbidity and timber harvest in northwestern California have been well studied in recent years (Klein, 2004), with increasing disturbance leading to both increase in peaks and duration of turbidity. Sigler et al. (1984) demonstrated that turbidity over 25 nephelometric units (ntu) limited steelhead juvenile growth. The latter threshold should be adopted by the Scott TMDL. Elevated turbidity has been noted as a specific problem in Moffett Creek (Kier Associates, 1999).

2.5 Temperature Problem Statement

The discussion of temperature problems in the Scott River lacks an interdisciplinary approach needed to show complex interactions that can ultimately result in water pollution. Discussions above note that channel changes related to increased peak discharge can make channels wide, shallow and open, which promotes stream warming. The TMDL did not use all available water temperature, which hampered examination of cumulative effects and elevation of water temperatures. The final Scott TMDL also needs to clearly recognize that water temperatures in smaller tributary basins accessible to coho salmon or that feed salmonid refugia in the Scott River canyon are controllable and that they need to meet water temperature requirements of coho salmon. Data from Thermal Infrared Radar (TIR) clearly indicates that water depletion drives water pollution, yet information from that survey was not used to draw that conclusion in the Scott TMDL.

Figure 16. Sand-sized particles dominate this pool tail crest on the Scott River near Ft. Jones. Photo by Pat Higgins from KRIS Version 3.0.

2.5.3 Summary of Temperature Conditions: The charts of stream temperature presented in this section go back to only 1996 (with some mainstem Scott data back to 1995). KRIS contains USFS data from 1994 and 1995 for the mainstem Scott and tributaries in the West Canyon sub-basin. These data are important because they date before the January 1, 1997 flood, when many streams in the Scott basin torrented, widening channels and removing riparian vegetation. Comparing these data with 1997-2004 data would show if temperatures increased as a result of the 1997 flood. These data should be incorporated into the West Canyon and mainstem charts in this section of the TMDL. The data are available online, with a list of charts located at:
http://www.krisweb.com/krisklamathtrinity/krisdb/webbuilder/selecttopic_scott_river.htm
The source table for the 1994 USFS data is located at:
http://www.krisweb.com/krisklamathtrinity/krisdb/webbuilder/sc_cst5.htm
The source table for the 1995 USFS data is located at:
http://www.krisweb.com/krisklamathtrinity/krisdb/webbuilder/sc_cst8.htm

2.5.2 Temperature-Related Desired Conditions: Coho salmon represent the most sensitive beneficial use in the Scott River basin and the final Scott TMDL must recognize the findings of Welsh et al. (2001) and the recommendations of the U.S. EPA (2003) in establishing a floating weekly average temperature of 16.8 C or less in any habitat inhabited by coho juveniles. In order to attain these conditions, impacts from riparian zone timber harvest must be limited and the interval of damaging flood flows must be decreased. In fact, logging in the riparian zone of Scott River tributaries has been active (Figure 17).

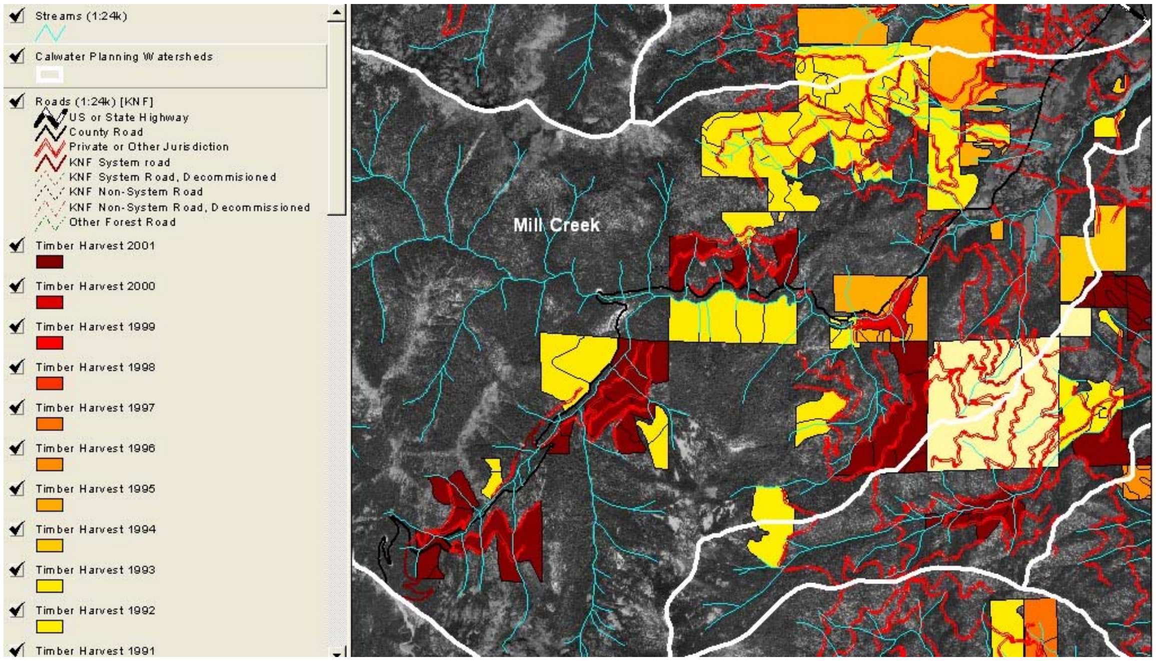

Figure 17. This map shows timber harvests on private land between 1991 and 2001, according to CDF, for the Mill Creek Calwater (upper Etna Creek). Timber harvest in recent years seems concentrated in near stream areas and other larger harvests overlap riparian zones.

Change scene detection data using 1994 and 1998 Landsat images (Levien et al, 2002) also show active timber harvest in riparian zones in recent years (Figure 18). Desired future watershed conditions should include riparian zones that approach the natural range of variability in size and height so that thermal buffering and large wood recruitment potential can be protected and improved. The TMDL needs to specifically recognize this problem so that RWB staff can prevent damage to core habitat areas and to provide for appropriate large wood recruitment. Riparian zones of headwater areas are often not delineated because the USGS 1:24000 stream maps are incomplete. Use of the SHALSTAB model will help highlight sensitive headwater swales, where logging may trigger failures and where natural landslides in unlogged areas may help recruit large wood to streams.

Desired future conditions for Scott River tributaries must also include sufficient flow to maintain water quality. The Watershed Sciences (2003) evaluation of water temperature problems in the Scott River shows an important relationship in Shackleford Creek (Figure 19). Shackleford Creek shows impacts of diversion as it goes from optimal for salmonids, to stressful or lethal for salmonids to a dry stream bed within a few miles.

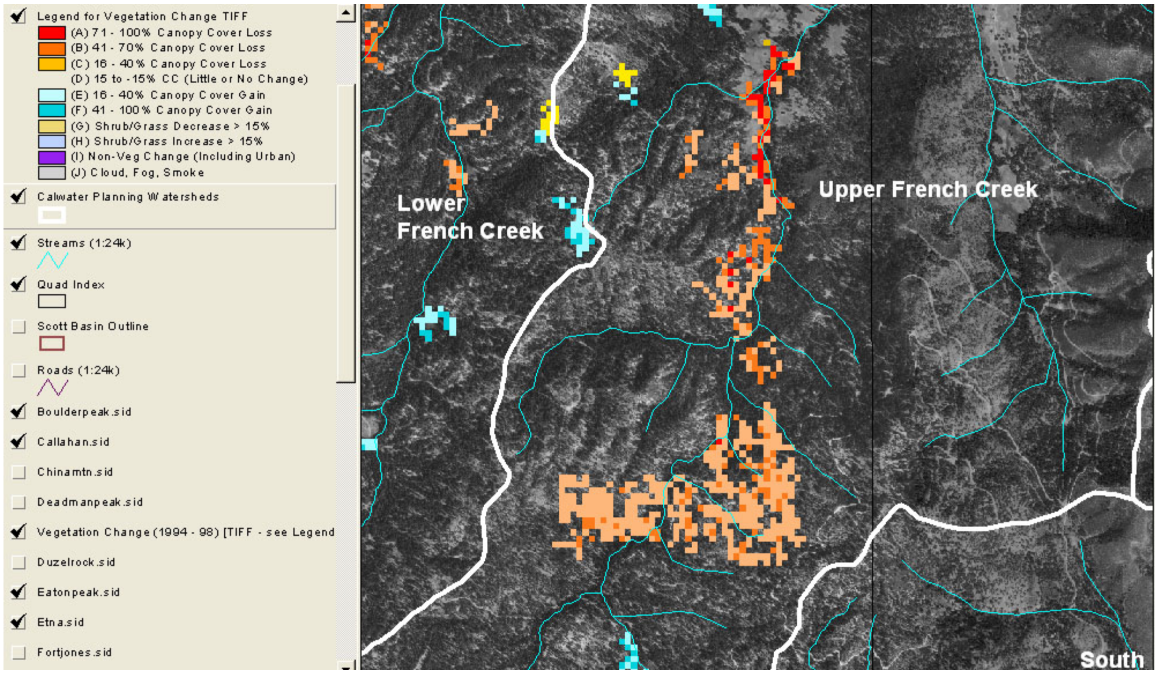

Figure 18. Vegetation change derived by comparing 1994 and 1998 Landsat images shows substantial decrease in canopy of reaches of lower French Creek. Data are from CDF and USFS Spatial Analysis Lab.

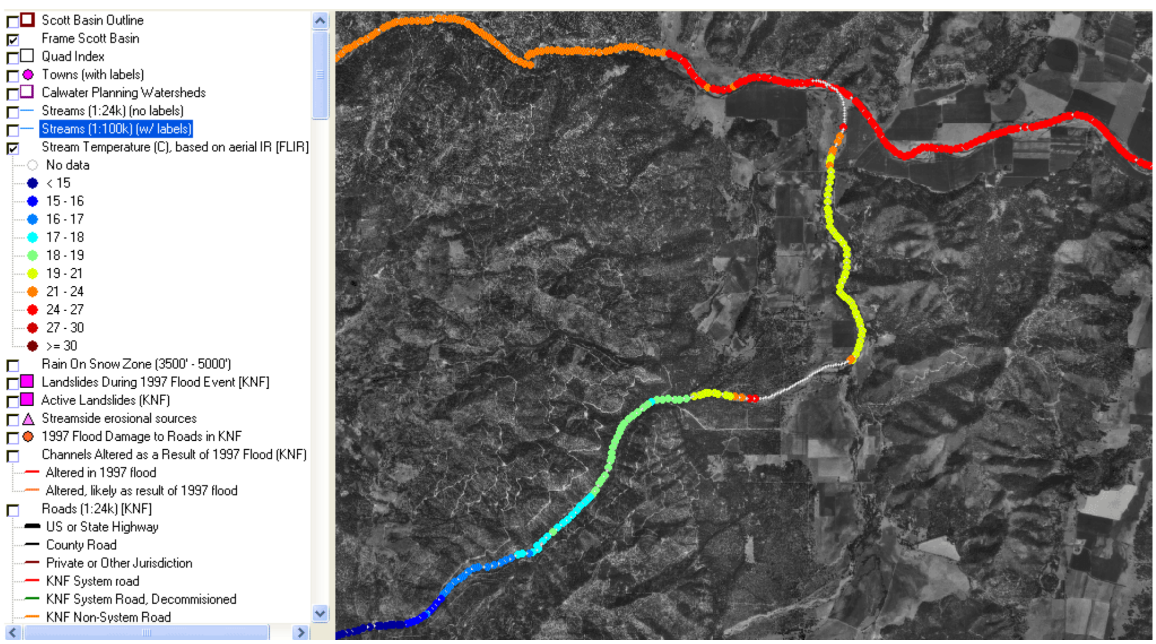

Figure 19. This map shows summary data of Scott River Thermal Infrared Radar (TIR) surveys for Shackleford Creek. Shackleford Creek flows northeast, then north to meet up with the mainstem Scott at the top of the figure. Note that temperature increases as flow is depleted. Missing temperatures (shown as grey reaches) indicates the stream is dry.

<u>2.5.2.1 Effective Shade:</u> The Scott TMDL states that "target shade conditions are those that result from achieving the natural mature vegetation conditions that occur along stream

channels in the watershed." The TMDL then fails to note that timber harvests have been active in riparian zones, despite availability of USFS and CDF 1991-2002 timber harvest data.

2.5.2.2 Thermal Refugia: The Scott TMDL mentions cold water at creek mouths as being important as coldwater refugia, but fails to make important links in discussion. *EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* (U.S. EPA, 2003) clearly states that the spatial distribution of refugia is critical to Pacific salmon survival, especially in circumstances where mainstem river temperatures are well over suitable. All refugia need to be identified and protected in the Scott TMDL and implementation should follow Bradbury et al. (1995) in protecting these areas as a priority and focusing restoration in restorable areas adjacent. Intensive management in the West Canyon TMDL sub-basin on Klamath National Forest lands prior to the 1997 storm caused massive landsliding, channel scour and significant elevation of water temperatures. The damage to salmonid carrying capacity was significant and future similar damage on low recurrence interval storms must be prevented, but the only way to do so is for the Scott TMDL to set limits of disturbance that minimize risk of cumulative watershed effects (see Chapter 5 comments below for recommended limits).

The Scott TMDL has a stated goal of "increased volume of thermally stratified pools." While this is a laudable objective, pools are unlikely to become deeper and tend toward their natural range of variability of volume and depth if the landscape is not closer to its normal hydrologic range of variability due to early seral stage conditions and high road densities. Similarly, channels will tend to have reduced pool frequency below high risk landslide zones that are disturbed by timber harvest or road building.

Chapter 3: Sediment

3.2 Road Related Sediment Delivery
3.2.1 Two Estimates Made:
"Because this type of road inventory was not available in other subwatersheds, the rates estimated in the South Fork were extrapolated to the rest of the mountainous subbasins in the Scott River watershed."

This extrapolation from the South Fork to the entire Scott basin required some assumptions. Based on comments on the pre-draft (Kier Associates, 2005b), information was added to the TMDL stating those assumptions. If only about 5.5 of 813 square miles of the watershed were surveyed, that is approximately only 0.6% of the watershed. This percentage should be stated in section 3.2.1.

3.2.2 Discrete Sediment Sources (Road Inventory and field-check):
The pre-draft of the TMDL noted that the field data collection in the South Fork found twice as many road-stream crossings than were contained in the GIS layers. Because of this, apparently the number of road-stream crossings in each of the rest of the sub-basins was doubled. Comments on the pre-draft (Kier Associates, 2005b) requested that if possible, some attempt should be made to determine if that is a valid assumption. Data from Klamath National Forest road surveys (mentioned on page 2-23) could provide a means to check the

accuracy of the 50% assumption. The RWB should determine the extent of the Scott River basin that has been surveyed by the USFS and compare the number of road/stream crossings identified in the USFS surveys in that area with the number of roads/stream crossings identified in that area from the GIS data.

In the public draft, the paragraph that mentions the doubling of road-stream crossing was removed and replaced with a new paragraph stating the Resources Management's (RM) SEDMODL estimate of stream crossings matched well with the RWB GIS estimate, so RM's estimate was used. Sediment calculations do not appeared to have changed. This situation is unclear and confusing.

This section also states that:

> "In the RM South Fork road survey, the largest contributing features were all located within a single quarter-mile-long section of failing road. These few features accounted for 75 percent of the total contribution from road failures. Thus, these features are anomalous in context. For that reason they were not included in the group that was used to calculate the rates used to extrapolate to the South Fork watershed but instead were combined and treated separately as a single discrete feature added to the South Fork Subwatershed sediment summary." (p 3-8)

While the RWB staff likely made the most correct decision possible under the circumstances, this fact points out the uncertainty in extrapolating from one sub-basin to the entire basin. Given that only approximately 0.6% of Scott basin was surveyed (see calculations above in comments on 3.2.2), and these large features were found, there are almost certainly "anomalous" major features in other areas of the Scott basin. By not including those "anomalous" features, the RWB has likely skewed its estimate of road-related sediment production low, perhaps substantially. In response to comments on the pre-draft TMDL, RWB staff added the following acknowledgement:

> "So we may have underestimated anthropogenic sediment contributions. Sediment source inventory may be slightly underestimated because some anomalous features that were not large enough to be found on the landslide analysis may have not been counted." (p 3-11).

This may run counter to the RWB's directive (Clean Water Act, Section 303(d) and the associated regulations at 40 CFR §130.7) to include a margin of safety in the TMDL, and hence should be stated in discussions of the margin of safety in section 3.5.4.

<u>3.4.2 Streamside Mass Wasting and Erosion Features - Stratified Random Sampling:</u>
In response to comments on the pre-draft (Kier Associates, 2005b), language was added to this section of the TMDL stating that 21 of the approximately 2500 total miles of streams in the Scott watershed were sampled, which is approximately 0.8 percent. Any embedded assumptions should be stated. For instance, this analysis assumes does not take into account differences in watershed disturbance regimes between watersheds.

Chapter 4: Temperature

4.1.1 Temperature Sources: Stream Heating Processes: Scott TMDL discussions of temperature pollution do not reflect a current "best science" understanding of riparian conditions, air flow over the stream and their relationship to water temperature. The final document needs to reference Bartholow (1989), Essig (1998) and Poole and Berman (2001). Bartholow (1989) demonstrated that air temperature over the stream is by far the most significant driver of maximum water temperature (Figure 19).

Poole and Berman (2001) describe the relationship between riparian conditions and microclimate over the stream, which can have a major influence on water temperature in smaller upland tributaries. For example, forest harvest back from the area where direct shade is provided to the stream may open air flow and allow more heat exchange with the water. This presents a potential problem in the Scott River basin Westside tributaries, where such shifts that could eliminate coho habitat without changing the shade.

The TMDL for temperature in Idaho (Essig, 1998) recognized the water temperature air temperature relationship presented by Bartholow (1989). The Scott TMDL model runs mention that microclimatic effects were considered, but the description of model parameters and assumptions is lacking.

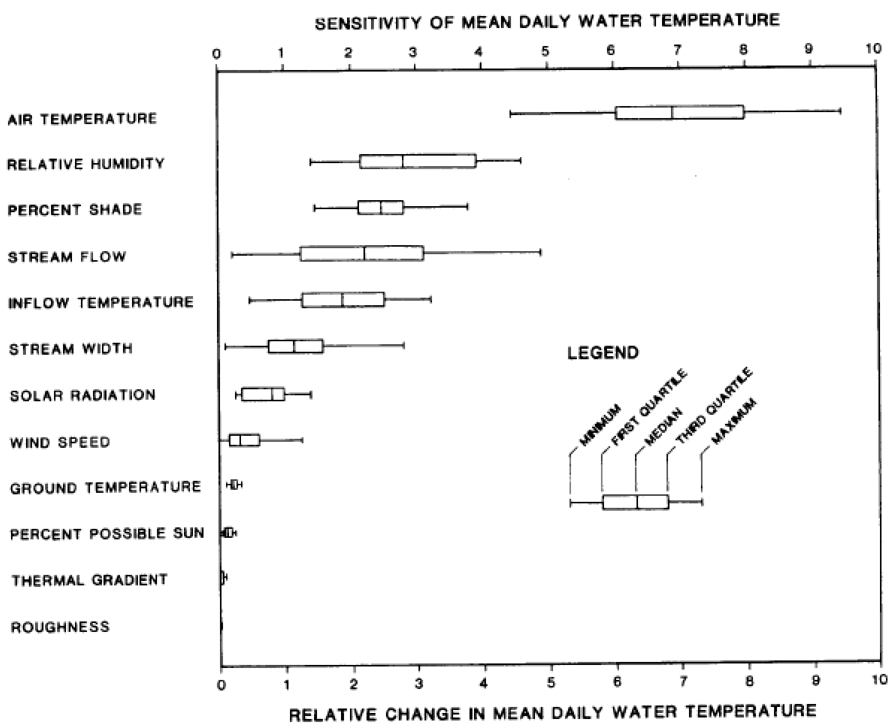

Figure 19. This chart from Bartholow (1989) shows that air temperature and relative humidity have a greater effect on mean daily water temperature than shade.

Science associated with the Northwest Forest Plan (FEMAT, 1993) indicates that the zone of riparian influence is two site potential tree heights or more (Figure 20). Water temperature buffering, in the form of cool air temperatures and high humidity over the stream, rapidly deteriorates under one site potential tree height protection (Chen, 1991). As mentioned in discussion of section 2.5.2.1, timber harvest has been active in riparian zones in the Scott River basin, which is decreasing desired conditions for optimum temperature buffer potential. The Scott TMDL states that the timber harvest permit process under CDF's jurisdiction will prevent future riparian damage despite previous studies (Ligon et al., 1999) and experience in the Scott River basin show that that process has not worked previously in this regard. The discussion in the Scott TMDL of modeling of riparian shade included the following: "Our analysis of factors affecting stream temperatures has determined that reductions of stream shade cause increases in stream temperature. Therefore, the California Forest Practice Rules do not ensure that water quality objectives set in the Basin Plan will be met." (p. 4-35)

Page 4-38 states that, "The load allocations for this TMDL are the shade provided by topography and potential vegetation conditions at a site with an allowance for natural disturbances such as floods, wind throw, disease, landslides, and fire, and is approximated as adjusted potential shade conditions as described in Section 4.4.1" This statement from the Scott TMDL infers that where topographic exists, retention of trees for shade might be decreased during timber harvests. This ignores the effects of riparian timber harvest on large wood recruitment and the implications for aquatic habitat.

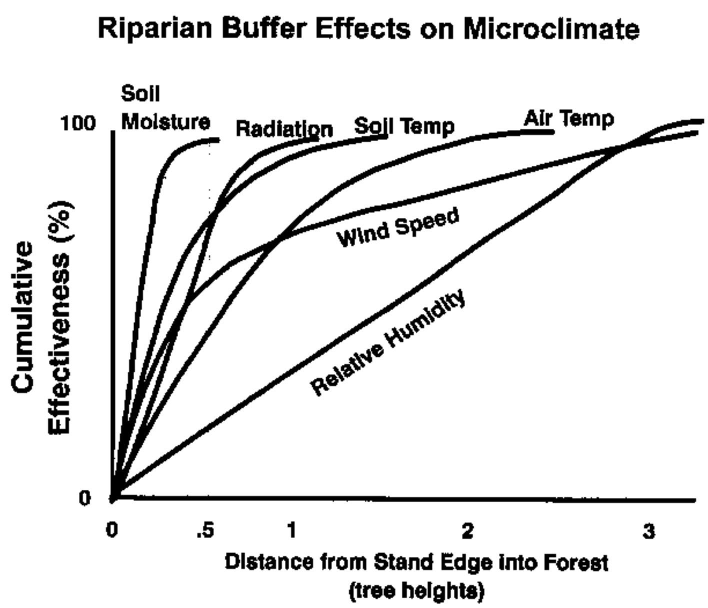

Figure 20. This figure taken from Chen (1991) shows how various riparian functions important to streams deteriorate as disturbance encroaches into stream side areas. One site potential tree height is likely 150-180 feet in Scott River basin forested areas.

4.1.2.2 Stream Heating Processes Affected by Human Activities in the Scott River Watershed:

The Groundwater section of the Scott TMDL on page 4-4 to 4-5 states:

> "The only readily available data that provide a glimpse of recent groundwater conditions are water table measurements at five wells in Scott Valley. Analysis of these data shows that in general drawdown is greater in dry years. The water table measurements for one of the wells are presented in Figure 4.1."

Comments submitted by Quartz Valley Indian Community (2005) to the Scott River Watershed Council contain a map and graphs for each of the five Scott Valley monitoring wells (included here as Appendix A). The graphs show the annual minimum and maximum measurements at each well, along with annual precipitation at the Fort Jones rain gage. The charts suggest that while annual maximum levels have remained relatively constant over time (fluctuating with precipitation), annual minimum levels have declined since 1965 (though they fluctuate with precipitation). Comments on the pre-draft (QVIC, 2005b) requested that the RWB consider including these graphs and map in the TMDL. RWB staff responded verbally that in their opinion the wells were not strategically placed, do not represent overall conditions in the valley, and hence do not support the suggestion above that annual minimum levels appear to be dropping. Graphs for the five wells should be included in the TMDL, or written justification provided as to why they were not utilized.

<u>4.3.1.7 Results and Discussion</u>: This section discusses the results of modeling scenarios. The combined scenarios included combinations of changes to individual factors such shade, groundwater accretion, surface diversions, and channel geometry. In the pre-draft, no figure was included showing the results of combined scenarios. As a result of comments on the pre-draft (Kier Associates, 2005), figure 4.17 was included in the public draft TMDL. It indicates that with potential riparian shade and a 50% increase in groundwater accretion, temperatures could be reduced approximately 5 to 7 degrees C in most of the Scott Valley and in the upper section of the Scott Canyon, with almost the entire Scott Valley being under 22 degrees C.

<u>4.3.2.1 Boundary Conditions:</u> This section contains a typo. The reference to Figure 4.18 should be a reference to Figure 4.19 instead. The reference to Figure 4.19 should be a reference to Figure 4.20 instead.

<u>4.3.2.7 Results and Discussion:</u> This section contains a typo. The reference to Figure 4.20 should be a reference to Figure 4.21 instead.

<u>4.5.2 Synthesis: Scott River Tributaries</u>: This section provides important recognition that forest management activities caused debris flows that damaged channels and riparian vegetation in Scott River tributaries, negatively impacting water temperatures.

<u>4.6 Recommendations for Additional Study and Future Action:</u> Changes suggested in pre-draft comments (QVIC, 2005) about the wording of regarding riparian grazing workshops were made.

Chapter 5: Implementation

The RWB has an obligation to make sure that the water quality objectives are met, and beneficial uses restored and protected, particularly because the final Scott TMDL Action

Plan will be amended to the Basin Plan (RWB, 2003). If there are multiple ways to meet the objectives, we support giving landowners the flexibility to decide how they want to meet those objectives. For example, if other regulatory and policy processes such as the Scott Incidental Take Permit (SRCD, In Draft), Coho Recovery Plan (CDFG, 2004), and Timber Harvest Plans will result in the attainment of water quality objectives, then further regulation by the RWB is not necessary.

Duplicative and overlapping regulation benefits no one. Unfortunately, these other processes rely almost wholly on voluntary measures that neither guarantee that water quality problems will be remedied nor that TMDL objectives will be achieved. When other policy approaches and voluntary landowner actions fail to achieve the TMDL objectives, then the RWB must use its considerable regulatory and enforcement authority to take necessary actions to ensure results.

The implementation actions requested in these comments are summarized below as Table 1 (a revised version of Table 4 from the proposed Scott TMDL Basin Plan amendment language).

5.1.1.1 Prioritization of Implementation Actions

This section has been added since the pre-draft, likely in response to the Tribes comments on the pre-draft (Kier Associates 2005b). The statement "Where reaches of the Scott River and its tributaries are providing suitable freshwater salmonid habitat, protection of these areas should be a priority for restoration efforts." (p 5-4) is somewhat helpful, but could be improved by specifically mentioning coho salmon and their coldwater refugia needs.

The final Scott TMDL should follow the approach of Bradbury et al. (1995), which is to identify the most intact habitat patches and to begin restoration by making sure that these areas are protected and enhanced as a top priority. In the Scott River basin, these would be the stream reaches with coho salmon (Figure 1) or those that provide coldwater refugia for other Pacific salmon species. As we indicated above, many surveys have been conducted in recent years to identify locations where coho salmon spawn (Quigley, 2005, Maurer, 2002; Maurer, 2003; SRCD, 2004). RWB staff will need to prevent timber harvest in riparian zones or sensitive headwater areas through its authority to condition waste discharge requirements on timber harvest plans and the final Scott TMDL should explicitly articulate that need and action. The protection of refugia and the restoration of water quality will also require protecting and restoring tributary stream flows.

5.1.7 Implementation Actions to Address Water Temperature and Vegetation that Provides Shade to the Water Bodies: In order for TMDL implementation to succeed it is important that the RWB (and other agencies and stakeholders) not suffer from "tunnel vision", but instead view the watershed in a system-wide, holistic fashion with its attendant complexities and interrelationships. The RWB's primary concern is protection and restoration of water quality, but the restoration of water quality can only succeed in the context of a broader ecological recovery effort. For example, if low recurrence interval storm events continue to cause channel damage that triggers elevated water temperatures and takes decades to recover, then success of the Scott TMDL implementation will be confounded.

Alterations in stream channel morphology are a source of sediment and temperature problems in the Scott River and its tributaries. Factors likely contributing to these alterations include increased sediment supply and increased peak flows (i.e., from upslope watershed disturbance), overgrazing, and a variety of flood control efforts including riparian vegetation removal, channel straightening, levee construction, and the placement of riprap. The Scott TMDL does a fairly good job of outlining the effects of these various watershed processes except for the risk of increased flows due to rain on snow events.

While the RWB's authority may be confined, that should not prevent it from fostering a long-term vision of what a restored Scott basin could look like. Appendix A of the draft TMDL includes historic channel and riparian condition descriptions that can guide efforts toward desired future conditions. While the technical portion of the TMDL sets gallery cottonwood forest as the "potential" vegetation for much of the Scott Valley, the proposed draft implementation plan needs to define the steps necessary to achieve that potential.

Appendix A provides a good discussion of the ecology and management of various riparian tree species present in the Scott Valley. The information presented on black cottonwood suggests that while Scott Valley historically provided excellent habitat for cottonwoods, the cottonwood population has declined dramatically over the 20th century. Key reasons include clearing of riparian vegetation, channelization, and lowering of the ground water table.

Restoring channel processes, including giving the river room to meander through multiple channels, is key to the restoration of stream temperatures and aquatic habitat complexity in the Scott River and its tributaries. Absent restoring a sinuous and meandering channel, the re-establishment of cottonwood gallery forests throughout the Scott Valley may not possible. Establishing a cottonwood forest would have major benefits for water temperatures and channel processes and achievement of TMDL objectives (see discussion under 5.1.9 below).

5.1.9 Flood Control and Bank Stabilization Implementation Actions

Much of the riprap and levees built along the mainstem Scott River were publicly funded through the U.S. Soil Conservation Service (now Natural Resources Conservation Service) and the U.S. Army Corps of Engineers. As noted on page 5-17 of the TMDL, "The Corps and the NRCS do not retain jurisdiction or ownership over these levees and flood control structures." It is likely that with the passage of time and the occurrence of floods that these structures will weaken and eventually fail. Failure may happen piecemeal or all at once, but eventual failure is inevitable.

It is unlikely that individual landowners will have the resources with which to repair these structures. The state and federal governments are not likely to provide the resources to maintain the Scott Valley's levee system. The Scott TMDL should recommend that future levee repairs have as a goal creation of a more sinuous channel with added cottonwood and willow trees to meet both long term flood control objectives and the water quality objectives of the TMDL.

Given the degraded state of riparian vegetation in the Scott River basin, we would urge the RWB to use its Clean Water Act Section 401 authority to ensure that bank stabilization projects conducted in the Scott basin incorporate riparian planting, and that no rock-only bank stabilization projects are permitted.

The Scott TMDL needs to specifically address actions that are recommended and those that the RWB staff would oppose when future large floods cause extensive riparian damage similar to January 1997. After the 1997 flood, federal emergency funds were used to clear and straighten channels, with damaging impacts on the channels and their riparian vegetation (Kier Associates, 1999) and recurrence of this pattern of action must not be allowed. Possible alternative flood-control scenarios include setting levees back on the floodplain away from the active channel, providing the river with some space to meander within levees.

As noted on page 5-18, it is possible to stabilize banks, without having a detrimental effect on stream temperatures, by incorporating vegetation into bank stabilization design. An innovative technique that may have application in the Scott Valley was developed in Anderson Creek, a tributary to the Navarro River in western Mendocino County, by Chris Tebbutt (IFR, 2003).

During a large flood in 1983, the channel at Mr. Tebbutt's property went from about 100 feet in width to over 800 feet, washing away valuable farmland and leaving a wide, warm and open reach of creek. Shortly after this erosional event, wing deflectors with boulders were installed and trees were planted behind the deflectors. These provided mass to turn the energy of the river at much less cost than boulders.

The deep planting of cottonwoods accelerated the trees' growth. The sections both above and below the Tebbutt property have now been treated and the channel was approaching its pre-disturbance width in 2003. Riparian vegetation is trapping sediment and building new streambanks. Stratification of deep pools formed off structures provide rare summer juvenile salmonid rearing habitat. While Anderson Creek is not quite as large as the Scott River, it does have substantial stream power and bioengineering methods used are likely transferable. A description of the Anderson Creek projects, with before, during, and after photographs is available online by viewing the "Restoration Tebbutt's" photo tours topics at: http://www.krisweb.com/krisnavarro/krisdb/webbuilder/selecttopic_tour.htm
A selection of photographs is included here as Figures 20-22.

The Scott TMDL and Kier Associates (1999) point out that many miles of mainstem Scott River riparian zones have cattle exclusion fencing and many reaches have also been tree planting project sites. The resulting narrow leave strips may not be sufficient to assure riparian function and protection of agricultural land from flood damage (Kier Associates, 1999). Another possible avenue for riparian restoration would be the use of conservation easements, which typically involve compensation to the landowner in exchange for long-term restrictions on the use of their property. With conservation easements, landowners would reduce agricultural activities in areas near stream channels, facilitating riparian restoration and reducing flooding of agricultural land.

The final Scott TMDL should recommend the use of computer modeling software to involve the community in the creation of positive future scenarios that allow for both conservation and a thriving agricultural economy. Software like CommunityViz and Ecomodeler can be employed to show both ecological and economic scenarios. These could be used, for example, to explain why it is in the landowners' interest to negotiate the acquisition of riparian easements on the mainstem Scott River in Scott Valley.

1984

Figure 20. This photo shows Chris Tebbutt deep planting cottonwood and willows in 1984. The dark branches at the left are fence post-sized black willows. Photo by Chris Tebbutt.

1986

Figure 21. Two years later the outside curve of Anderson Creek on the Tebbutt property is unprotected but the trees are growing. The stream channel in 1986 shifted into the planted areas. Photo by Chris Tebbutt.

2001

Figure 22. Cottonwoods, willows and alders line both banks of Anderson Creek in this photo taken looking upstream on the Tebbutt property in spring 2001. Many trees at the left of the photo are actually rooted in vegetated hard points with massive rock structures. The deep planting of cottonwoods was used on both sides of the creek. Photo by Chris Tebbutt.

<u>5.1.8.2 Water Use Implementation Actions</u>: Many previous studies (CH2M Hill, 1985; Kier Associates, 1991 and 1999) described flow depletion and the loss of coldwater fisheries in the Scott River basin and recognize that recovery of salmon and water quality will not succeed without solutions to problems involving water rights, water use and groundwater pumping.

Long-term USGS flow records show clearly that base flows in the Scott River have diminished (Figure 23). Reduced flows result from increased surface diversions, changes in cropping patterns, decreased base flows due to changes in upland conditions, decreased available surface water due to aggradation, and increased groundwater pumping.

The final TMDL should <u>explicitly</u> recognize that the flow trends of recent years are precisely the opposite of those necessary for the recovery of water quality and fish resources. Remedies for flow changes related to watershed conditions and aggradation have been described in previous sections. The final TMDL needs to also recommend that changes in crops from water-hungry alfalfa to high-value dry-farmed species be considered and that implementation of available water conservation measures be instituted by a date certain.

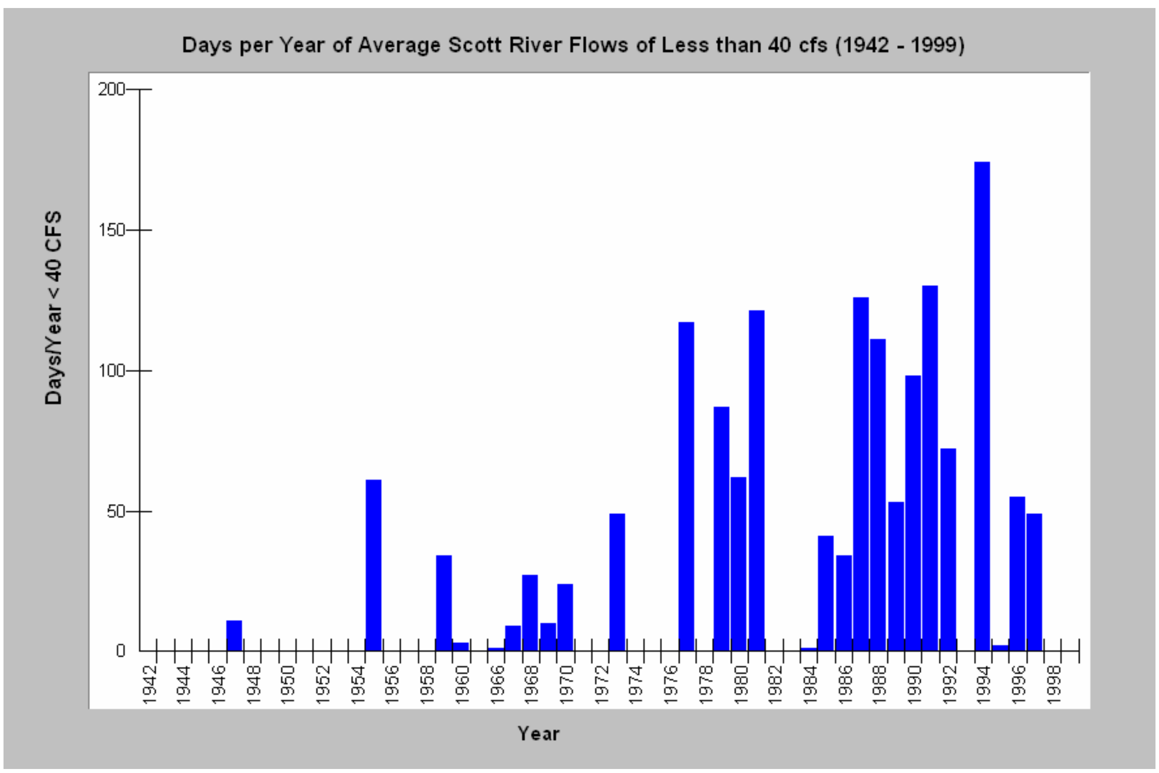

Figure 23. USGS flow data for the Scott River were used to create the above chart showing an increase in the days with less than 40 cubic feet per second at Fort Jones with a major increase over the period of record.

The final Scott TMDL needs to call for the RWB to exert authority in cases such as Shackleford Creek (Figure 19) where the depletion of flows makes achievement of water quality objectives impossible. The State Water Resources Control Board has the authority to require increased bypass 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,* see http://chrome.law.cornell.edu/supct/html/92-1911.ZD.html*).* This case explicitly states that water quality regulatory agencies can, under the Clean Water Act, require bypass flows to achieve water quality protection purposes – that, as has been demonstrated so many times, the management of water quality and water quantity are inseparable:

> "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)."

Figure 4.13 indicates that water temperatures in the mainstem Scott are highly influenced by groundwater accretion. Based on Figure 4.13 and other modeling results presented in the Scott TMDL, it is apparent that water temperature problems cannot be fully resolved without appropriate action taken to limit ground water pumping. The Scott TMDL changed recommendations for a State Water Resources Control Board Water Rights Division groundwater study to one overseen by the County of Siskiyou.

The RWB should consider, in the alternative, recommending that the California Department of Water Resources conduct the necessary groundwater study because they have previously studied Scott Valley groundwater conditions, the Department has staff with the appropriate credentials for conducting such a study, and they enjoy a degree of trust with Scott Valley residents, having served their water resource study needs over the years.

There is already enough evidence to show that groundwater pumping is likely causing deleterious effects to both surface water quantity <u>and</u> quality (see Appendix A of this comments document). Department of Water Resources data indicate that the installation of wells has continued and suggest that postponing discussions and action on this critical issue is unwise. A prompt groundwater study carried out by qualified scientists will provide information on what needs to be done to remedy the problem.

If the final Scott TMDL continues to recommend a local lead role for the groundwater study, the Quartz Valley Indian Reservation should also be named as a specific party to the study. Page 5-16 of the TMDL states that "The Regional Water Board requests that the County of Siskiyou, in cooperation with the Siskiyou Resource Conservation District (SRCD) and other appropriate stakeholders, conduct the above mentioned study." That statement should be revised to read "The Regional Water Board requests that the County of Siskiyou, in cooperation with the Quartz Valley Indian Reservation (QVIR), Siskiyou Resource Conservation District (SRCD), and other appropriate stakeholders, conduct the above mentioned study." It is important to note that Tribes are not stakeholders, pre se; they are sovereign nations with a unique status.

We recommend the re-insertion of the language that was included in the pre-draft TMDL, but removed from the public draft, recommending that the State Water Board and its Division of Water Rights "take the findings of the research into consideration and act accordingly to protect and restore the instream beneficial uses of the Scott River and its tributaries, with particular focus on those beneficial uses associated with the cold water fishery." We recognize that the RWB has the authority to make this request regardless of what language is included in, or excluded from, the TMDL and we would expect that as changes in groundwater management are found to be necessary to protect and restore the beneficial uses of the Scott River that the RWB would, as required by the Clean Water Act, make such a request.

5.1.1 Road and Sediment Waste Discharge Implementation Actions for Individual Responsible Parties: The final Scott TMDL should set quantitative limits on allowable road densities in each watershed (see comments in section 2.4.1, 2.4.3.2, and 2.4.3.5 above). If the RWB does not have adequate information on which to base such a limit, studies should be conducted to determine what an appropriate value would be. See Table 1 for a list of suggested targets for watershed condition with references on which they are based. Also, a requirement should be imposed on the USFS and private timber companies that roads that cannot be annually maintained must be fully decommissioned (see comments on section 2.2.2.3 above) similar to that included in the Redwood Creek TMDL (U.S. EPA, 1998b).

Multiple road crossings on Scott River tributaries failed in the January 1997 storm resulting in extensive channel scour and increase in stream temperatures (de la Fuente and Elder, 1998). The final Scott TMDL needs to set targets for stream crossings similar to Armentrout et al. (1999) and such standards should be enforced by RWB staff using their waste discharge authority during the timber harvest plan review process.

Roads data from Klamath National Forest show that some roads crossing lower Scott River tributaries have been decommissioned. Similar decommissioning is needed for roads on private lands. Roads crossing stream reaches that have a history of torrenting should have concrete fords, not culverts, similar to those installed by KNF after the 1997 storm (Kier Associates, 1999). The final TMDL needs to recognize sensitive headwater areas and the need to prevent road construction in areas shown to have a high risk of land-sliding through the use of the SHALSTAB model, unless a professional geologist makes a finding that there is no risk of failure.

5.1.8 Timber Implementation Actions for Private and Public Responsible Parties: The final Scott TMDL should set quantitative limits on the percentage of a watershed that can be harvested in a given time frame (Reeves et al., 1993). If the RWB does not have adequate information upon which to base such a limit, studies should be conducted to determine what an appropriate value would be. For more information on this subject, see comments on section 2.4.3.5 above.

The lack of forest growth indicated by Landsat change scene and vegetation data (see discussions in Chapter 2 above) shows a clear need to restrict forest harvest in the rain on snow zone until stands previously disturbed are in a more mature condition to lessen the risk of rain on snow events. RWB staff need to limit canopy reduction on lands lying between 3,500 and 5,000 feet in elevation using its waste discharge requirement-setting authority during the timber harvest plan review process. Similarly, RWB staff should flag for geologic review any timber harvest on areas shown to be at a high risk for failure through SHALSTAB modeling (see Chapter 2 discussions).

5.1.9 Implementation Actions for the United States Forest Service

As recommended in section 2.4.3.5 above, the final Scott TMDL should set quantitative limits on the percentage of a watershed that can be harvested in a given time frame. The findings of de la Fuente and Elder (1998) indicate that the current BMPs applied on USFS lands have been insufficient to prevent cumulative watershed effects and increased restrictions on activity are needed. Also, maximum allowable road densities should be set as recommended in section 5.1.1 above.

Table 2. Recommended targets for watershed condition.

Parameter	**Upland Target Conditions**	**References**
Road Densities	<2.5 mi./sq. mi.	USFS (1996), NMFS (1995), Armentrout, (1998)
Road-Stream Crossings	<2 road crossings per mile of stream	Armentrout et al. (1998)
Timber Harvest	<25% of a watershed in 30 years	Reeves et al. (1993)
Unstable areas	No disturbance in SHALSTAB high risk zones w/o geologic review	Dietrich et al. (1998)

Chapter 6: Monitoring

There is enough information available to RWB staff to make specific recommendations for trend monitoring in the final Scott TMDL as required by Section 13242 of the California Water Code. The final Scott TMDL also needs to specifically state that all data used for monitoring and assessment under TMDL implementation should available as raw data, which is necessary for a transparent scientific process. Although time frames for recovery may be difficult to define exactly, the final Scott TMDL needs to establish an expected time line for recovery that can be amended through adaptive management during the implementation phase. The Scott TMDL must also specify that all data collected as part of TMDL monitoring should be added to an easily accessible electronic database.

In Stream Monitoring Methods and Locations: The draft Scott TMDL defines several targets for in stream conditions that are appropriate tools for discerning trends and abating water quality problems, but we recommend the addition of other cost-effective tools that have been widely employed in previous TMDLs or by the USFS. The Scott River basin is already data rich and continuing to collect data for trend monitoring of a similar type in the same or similar locations is both logical and practical. Table 3 shows recommended tools and locations for monitoring both sediment and water temperature. Additional details are include in discussions on section 2.4.2 above.

Table 3. Recommended TMDL Implementation Trend Monitoring Methods and Locations

Method	Reference	Location
Benthic Macroinvertebrates	Harrington and Born (1999)	Repeat at previously monitored locations every five years or after major storm event
Large Woody Debris	Schuett-Hames et al. (1999)	Coho salmon tributaries lower than fourth order
Embeddedness	CDFG (1998)	All stream sizes. Not necessary if more quantitative fine sediment data are collected.
Pool Distribution and Depth	US EPA (1998b)	Use habitat typing data or directly measure pool depths to gauge trends in all sizes of streams
Percent fines (<0.85 mm, 6.4 mm)	Scott TMDL	Same locations as Sommarstrom et al. (1989) but add tributary locations where fine sediments are a problem or to gauge trends after restoration
Cross Sections and Longitudinal Profiles	Madej (2001)	Lower mainstem Scott River
Volume of Sediment in Pools (V*)	Lisle and Hilton (1992) and Knopp (1993)	Continue monitoring at French Creek stations but also use in other streams of appropriate gradient and confinement with sediment problems to gauge trends in response to land management changes or restoration
Median Particle Size (D50)	Knopp (1993), Gallo (2002) and Reynolds (2001)	
Turbidity	Klein (2004)	Moffett Creek and mainstem Scott above and below
Water Temperature	Welsh et al. (2001)	Continue monitoring at previously sampled locations

Data Transparency: The RWB staff must require that all trend monitoring data related to TMDL implementation and abatement of water quality problems be supplied in raw form in order to maintain scientific validity (Collison et al., 2003). Although some Scott River stakeholders have held the position that data collected on private land is proprietary, RWB staff can require data sharing as part of waste discharge monitoring related to timber harvest review, or other permitting actions.

Data Storage and Management: In order to facilitate participation of Tribes and the public in Scott TMDL implementation, it is desirable to have a central data repository. One such existing database is the Klamath Resource Information System or KRIS (see www.krisweb.com), which is now has been in use in the Klamath and Trinity River basins since 1998. KRIS is an optimal data management tool because its cloning function allows easy generation of new charts when new data are added. KRIS content can be shared via the Internet as attached files with anyone having a current version of KRIS installed on their computer. KRIS also captures reports and metadata, providing a means to share data in its full context, reducing the risk of the data be inappropriately used.

Time Frame for Recovery: Biological response to restoration actions may takes several life cycles, while physical stream habitat may respond more quickly (Spence et al., 1996). Both V* results and fine sediment measurements in French Creek indicate that road-related erosion prevention has resulted in improved water quality conditions. Consequently, trends in physical habitat should be checked within five years and if no response is detected within ten years, a change in management practices should implemented.

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Roads & Sediment Waste Discharges	• Parties Responsible for Roads and Sediment Waste Discharge Sites. • Regional Water Board.	• The Regional Water Board encourages parties responsible for roads and sediment waste discharge sites to take actions necessary to prevent, minimize, and control road-caused sediment waste discharges. Such actions may include the inventory, prioritization, control, monitoring, and adaptive management of sediment waste discharge sites and proper road inspection and maintenance. • The Regional Water Board's Executive Officer shall require parties responsible for roads, on an as-needed, site-specific basis, to develop and submit an Erosion Control Plan and a Monitoring Plan. An Erosion Control Plan shall describe, in detail, sediment waste discharge sites and how and when those sites are to be controlled. By [insert date that is 2 years from the date of U.S. EPA approval], criteria shall be developed for determining when an Erosion Control Plan shall be required, although nothing precludes the Executive Officer from requiring Erosion Control Plans prior to this date. • Should discharges or threatened discharges of sediment waste that could negatively affect the quality of waters of the State be identified in an Erosion Control Plan or by other means, dischargers shall be required to implement their Erosion Control Plan and monitor sediment waste discharge sites through appropriate permitting or enforcement actions	***• Road densities need to be reduced to no more than 2.5 mi. /sq. mi. per USFS (1996) and NMFS (1995) to reduce sediment and potential for damaging elevated peak flows. Priority for action needs to target coho salmon sub-basins or streams providing refugia.*** ***• Reduce road networks to those that can be annually maintained and make sure that decommissioned roads require no maintenance (U.S. EPA, 1998).*** ***• All major land owners should be required to participate in Erosion Control and Monitoring Plans.*** ***• Trend monitoring data need to be specified showing aquatic recovery companion with mitigation and restoration measures and additional abatement actions taken if targets are not met within a specific time period.*** ***• Prevent winter use of native surface logging roads due to discharges of fine sediment from truck traffic wearing down road beds (Collison et al., 2003).***

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Roads	• California Department of Transportation (Caltrans). • Regional Water Board.	• Regional Water Board staff shall evaluate the effects of Caltrans' state-wide NPDES permit, storm water permit, and waste discharge requirements (collectively known as the Caltrans Storm Water Program) by [insert date that is 2 years from the date of U.S. EPA approval]. The evaluation shall determine the adequacy and effectiveness of the Caltrans Storm Water Program in preventing, reducing, and controlling sediment waste discharges and elevated water temperatures in the North Coast Region, including the Scott River watershed. If Regional Water Board staff find that the Caltrans Storm Water Program is not adequate and effective, Regional Water Board staff shall develop specific requirements, for State Water Board consideration, to be incorporated into the Caltrans Storm Water Program at the earliest opportunity, or the Regional Water Board shall take other appropriate permitting or enforcement actions.	***Proposed action sufficient.***

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Roads	• County of Siskiyou (County). • Regional Water Board.	• The Regional Water Board and the County shall work together to draft and finalize a Memorandum of Understanding (MOU) to address county roads in the Scott River watershed. The MOU shall be drafted and ready for consideration by the appropriate decision-making body(ies) of the County by [insert date that is 2 years from the date of U.S. EPA approval]. The MOU shall include the following contents: 1. A date for the initiation and completion of an inventory of all sediment waste discharge sites caused by county roads within the Scott River watershed, which can be done with assistance from the Five Counties Salmonid Conservation Program. 2. A date for the completion of a priority list of sediment waste discharge sites. 3. A date for the completion of a schedule for the repair and control of sediment waste discharge sites. 4. A date for the completion of a document describing the sediment control practices to be implemented by the County to repair and control sediment waste discharge sites, which can be done with assistance from the Five Counties Salmonid Conservation Program. 5. A description of the sediment control practices, maintenance practices, and other management measures to be implemented by the County to prevent future sediment waste discharges, which can be done with assistance from the Five Counties Salmonid Conservation Program. 6. A monitoring plan to ensure that the sediment control practices are implemented as proposed and effective at controlling discharges of sediment waste. A commitment by the County to complete the inventory, develop the priority list, develop and implement the schedule, develop and implement sediment control practices, implement the monitoring plan, and conduct adaptive management.	***Proposed action sufficient.***

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Grading	• County of Siskiyou (County). • Regional Water Board	. • The Regional Water Board encourages the County to develop a comprehensive ordinance addressing roads, land disturbance activities, and grading activities outside of subdivisions in the Scott River watershed by [insert date that is 1 year from the date of U.S. EPA approval]. The ordinance may be specific to the Scott River watershed or county-wide in scope.	***Proposed action sufficient.***
Dredge Mining	• Regional Water Board.	• Regional Water Board staff shall investigate the impact of suction dredge mining activities on sediment and temperature loads in the Scott River watershed by [insert date that is 3 years from the date of U.S. EPA approval]. If Regional Water Board staff find that dredge mining activities are discharging deleterious sediment waste and/or resulting in elevated water temperatures, staff shall propose, for Board consideration, the regulation of such discharges through appropriate permitting or enforcement actions.	***Proposed actions appropriate with the following addition:*** ***• If there is a substantial increase in mining activity (i.e. due to increase in price of gold), Regional Water Board staff will accelerate timeline for completion of study.***

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Temperature & Vegetation	• Parties Responsible for Vegetation that Shades Water Bodies. • Regional Water Board.	• The Regional Water Board encourages parties responsible for vegetation that provides shade to a water body in the Scott River watershed to preserve and restore such vegetation. This may include planting riparian trees, minimizing the removal of vegetation that provides shade to a water body, and minimizing activities that might suppress the growth of new or existing vegetation (e.g., allowing cattle to eat and trample riparian vegetation). • The Regional Water Board shall develop and take appropriate permitting and enforcement actions to address the human-caused removal and suppression of vegetation that provides shade to a water body in the Scott River watershed. The Regional Water Board's Executive Officer shall report to the Regional Water Board on the status of the preparation and development of appropriate permitting and enforcement actions by [insert date that is to be determined].	• The Regional Water Board shall develop and take appropriate permitting and enforcement actions to address the human-caused removal and suppression of vegetation Scott River watershed riparian zones to maintain shade, microclimate and large wood recruitment. ***As general guidance, with some exceptions, removal of riparian vegetation is prohibited.*** The Regional Water Board's Executive Officer shall report to the Regional Water Board on the status of the preparation and development of appropriate permitting and enforcement actions by [insert date that is to be determined]. ***• The Regional Water Board encourages the restoration of upland and valley floor riparian zones necessary to reduce sediment and temperature pollution.*** ***• The Regional Water Board specifically recommends the re-establishment of cottonwood gallery forest in valley floor riparian zones to provide better shade, channel definition, habitat complexity, and functions such as trapping sediment from flood waters and protecting valuable agricultural land.*** ***• The Regional Water Board recommends the use of conservation easements in riparian zones on agricultural land to allow riparian recovery while maintaining viability of the local agricultural economy.*** ***• The Regional Water Board recommends long term goals of rearrangement of rip rap in reaches of the Scott River where the channel is simplified and constricted with a secondary objective of providing the river with access to its flood plain to assist in replenishing groundwater.*** ***• The Regional Water Board will act to reduce ground water pumping and depletion where it is found to be limiting recruitment and survival or riparian trees.***

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Temperature & Vegetation	• Parties Responsible for Vegetation that Shades Water Bodies. • Regional Water Board.		Continued from previous page. ***• The Regional Water Board shall address the removal and suppression of vegetation that provides shade to a water body through the up-coming Stream and Wetland Protection Policy. The Policy will be a comprehensive, region-wide riparian policy that will address the importance of shade on instream water temperatures and will potentially propose riparian set-backs and buffer widths. The Policy will likely propose new rules and regulations, and will therefore take the form of an amendment to the Basin Plan. Regional Water Board staff are currently scheduled to develop this Policy by 2007, with funding available through a grant from the U.S. EPA.***
Water Use	• Water Users. • County of Siskiyou (County). ***• Quartz Valley Indian Reservation*** • Stakeholders. • Regional Water Board.	• The Regional Water Board encourages water users to develop and implement water conservation practices. • The Regional Water Board requests the County, in cooperation with other appropriate stakeholders, to study the connection between groundwater and surface water, the impacts of groundwater use on surface flow and beneficial uses, and the impacts of groundwater levels on the health of riparian vegetation in the Scott River watershed. The study should: (1) consider groundwater located both within and outside of the interconnected groundwater area delineated in the Scott River Adjudication,** (2) the amount of water transpired by trees and other vegetation, and (3), if deleterious impacts to beneficial uses are found, identify potential solutions including mitigation measures and changes to management plans. • Should the County determine that it and its stakeholders are able to commit to conducting the above study, the County, in cooperation with other stakeholders, shall develop a study plan by [insert date that is 1 year from the date of U.S. EPA approval]. The study plan shall include: (1) goals and	***• The Regional Water Board shall take action to secure necessary instream flows to protect water quality where water diversion is the clear cause of impairment, such as where cold water tributaries are dewatered.*** ***• The Regional Water Board shall require water users to develop and implement water conservation plans and practices over a ten year time frame, where action is needed to restore surface flows and water quality.*** • The Regional Water Board requests that the Department of Water Resources, in cooperation with ***the Quartz Valley Indian Reservation and*** appropriate stakeholders, study the connection between groundwater and surface water, the impacts of groundwater use on surface flow and beneficial uses, and the impacts of groundwater levels on the health of riparian vegetation in the Scott River watershed. The study should: (1) consider groundwater located both within and outside of the interconnected groundwater area delineated in the Scott River Adjudication,** (2) the amount of water transpired by trees and other vegetation, and (3), if deleterious impacts to beneficial uses are found, identify potential solutions including mitigation measures and changes to

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
		objectives; (2) data collection methods; (3) general locations of data collection sites; (4) data analysis methods; (5) quality control and quality assurance protocols; (6) responsible parties; (7) timelines and due dates for data collection, data analysis, and reporting; (8) financial resources to be used; and (9) provisions for adaptive change to the study plan and to the study based on additional study data and results, as they are available.	management plans. • Should the DWR determine that it and its stakeholders are able to commit to conducting the above study, the DWR, in cooperation with ***the Quartz Valley Indian Reservation and*** other stakeholders, shall develop a study plan by [insert date that is 1 year from the date of U.S. EPA approval]. The study plan shall include: (1) goals and objectives; (2) data collection methods; (3) general locations of data collection sites; (4) data analysis methods; (5) quality control and quality assurance protocols; (6) responsible parties; (7) timelines and due dates for data collection, data analysis, and reporting; (8) financial resources to be used; and (9) provisions for adaptive change to the study plan and to the study based on additional study data and results, as they are available.
Water Use	• Water Users. • County of Siskiyou (County). ***• Quartz Valley Indian Reservation*** • Stakeholders. • Regional Water Board.		***• The Regional Water Board requests that the State Water Board and its Division of Water Rights take the findings of the above groundwater study into consideration and act accordingly to protect and restore the instream beneficial uses of the Scott River and its tributaries, with particular focus on those beneficial uses associated with the cold water fishery.***

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Flood Control & Bank Stabilization	• Parties Responsible for Flood Control Structures or Dredge, Fill, and/or Bank Stabilization Activities. • Regional Water Board.	• The Regional Water Board encourages parties responsible for levees and other flood control structures to plant and restore stream banks on and around existing flood control structures. • The Regional Water Board shall rely on existing authorities and regulatory tools, such as the 401 Water Quality Certification program, to ensure that flood control and bank stabilization activities in the Scott River watershed are conducted in a manner that minimizes the removal or suppression of vegetation that provides shade to a water body and minimizes changes in channel morphology that could increase water temperatures.	• The Regional Water Board encourages parties responsible for levees and other flood control structures to plant and restore stream banks on and around existing flood control structures. • ***The*** Regional Water Board shall rely on existing authorities and regulatory tools, such as the 401 Water Quality Certification program, to ensure that flood control and bank stabilization activities in the Scott River watershed are conducted in a manner that minimizes the removal or suppression of vegetation that provides shade to a water body and minimizes changes in channel morphology that could increase water temperatures. ***As general guidance:*** ***- All bank stabilization projects conducted in the Scott River watershed will require a 401 permit.*** ***- All bank stabilization projects conducted in the Scott River watershed shall incorporate riparian plantings, and rock-only bank stabilization projects will not be allowed. Exceptions may be granted, but only occasionally with strong justification.*** ***• The Regional Water Board shall work with appropriate agencies and stakeholders to develop a protocol for what will occur after a large flood damages flood control structures and property. A goal of the plan will be to find cost-effective means to increase sinuosity of stream channels and re-establish the connection between streams and their floodplains.*** ***• The Regional Water Board will encourage and support landowners who choose to seek conservation easements to cease or reduce agricultural activities in areas near stream channels to facilitate riparian restoration and reduce flooding of agricultural land.***

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Timber Harvest	• Private & Public Parties Conducting Timber Harvest Activities. • Habitat Conservation Plan Holders. • Regional Water Board.	• The Regional Water Board shall use appropriate permitting and enforcement tools to regulate discharges from timber harvest activities in the Scott River watershed, including, but not limited to, cooperation with, and participation in, the California Department of Forestry and Fire Protection's timber harvest project approval process. • The Regional Water Board shall use, where applicable, general or specific waste discharge requirements and waivers of waste discharge requirements to regulate timber harvest activities on private and public lands in the Scott River watershed. • Timber harvest activities on private lands in the Scott River watershed are not eligible for Categorical Waiver C included in the Categorical Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities on Non-Federal Lands in the North Coast Region (Order No. R1-2004-0016, as it may be amended or updated for time to time) simply through the adoption of this TMDL Action Plan. However, timber harvest activities on private lands in the Scott River watershed may be eligible for Categorical Waivers A, B, D, E, and F, as appropriate. • Where a Habitat Conservation Plan (HCP) is developed, Regional Water Board staff shall work with the HCP holder to develop, for Board consideration, ownership-wide waste discharge requirements for activities covered by the HCP, with any additional restrictions necessary to protect water quality and beneficial uses.	***Proposed actions appropriate with the following additions:*** ***• In considering WDRs, the Regional Water Board shall examine indices of cumulative effects risk (i.e. road densities, percent of watershed area harvested, and road stream crossing density) in watersheds with proposed timber harvests and compare them to prudent risk levels recommended in regional scientific literature.*** ***• The Regional Water Board recognizes that water quality and aquatic habitats in some tributaries may be in such a degraded state that significant watershed rest (time period with limited harvesting) and erosion control efforts (such as road upgrading and decommissioning) must occur before additional large-scale commercial harvest is allowed. In general, wet-weather hauling will not be permissible.*** ***• The Regional Water Board staff will consider the following through waste discharge authority as part of timber harvest review: limiting riparian harvests to allow large wood recruitment for coho and maintaining near stream microclimate; reducing activities on unstable lands, reducing road densities, near stream roads and crossings; and returning forest conditions in the rain-on-snow zone to levels that reduce the risk of increased peak discharge.***

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
U.S. Forest Service & U.S. Bureau of Land Management	• U.S. Forest Service (USFS). • U.S. Bureau of Land Management (BLM). • Regional Water Board	• The Regional Water Board and federal land management agencies, including the USFS and the BLM, shall work together to draft and finalize a Memorandum of Understanding (MOU) that shall address sediment waste discharges, elevated water temperatures, and grazing activities within the Scott River watershed. The MOU shall be drafted and ready for consideration by the appropriate decision-making body(ies) by [insert date that is 2 years from the date of U.S. EPA approval]. The MOU shall include the following contents: Contents Related to Sediment Waste Discharges: 7. A date for the completion of an inventory of all sediment waste discharge sites and all roads on USFS/BLM land. 8. A date for the completion of a priority list. 9. A date for the completion of a schedule for the repair and control of sediment waste discharge sites. 10. A date for the completion of a document describing the sediment control practices to be implemented by the USFS/BLM to repair and control sediment waste discharge sites. 11. A description of sediment control practices, road maintenance practices, and other management measures to be implemented by the USFS/BLM to prevent future sediment waste discharges. 12. A monitoring plan to ensure that sediment control practices are implemented as proposed and are effective at controlling discharges of sediment waste. 13. A commitment by the USFS/BLM to complete the inventory, develop the priority list, develop and implement the schedule, develop and implement sediment control practices, implement the monitoring plan, and conduct adaptive management. Contents Related to Elevated Water Temperatures: 14. A commitment by the USFS/BLM to make permanent and implement the Riparian Reserve buffer width requirements. 15. A monitoring plan to ensure that the Riparian Reserve buffer widths are effective at reducing high water temperatures. 16. A commitment by the USFS/BLM to implement the Riparian Reserve monitoring plan and conduct adaptive management.	***• The Regional Water Board staff, through waste discharge authority in timber harvest review with the U.S. Forest Service, should consider a moratorium of any timber harvest in the Scott River basin that reduces canopy closure in the transient snow zone.*** ***• The Regional Water Board shall require that the USFS provide a study demonstrating forest regrowth and return to stand conditions (multi-tiered canopy) that lessen the risk of un-naturally high peak flows to prevent frequent flood damage to stream channels in the Scott River watershed.*** ***• The Regional Water Board staff shall consider withholding approval of timber harvests that substantially reduce the canopy in the lower Scott River watershed until the Redwood Sciences Laboratory study results on BMPs is released and it is demonstrated that USFS BMPs have protected water quality*** ***• The Regional Water Board will work cooperatively with the Klamath National Forest to reduce road networks within the Scott River to the level that can be actively maintained.*** ***• Roads decommissioned by the USFS to meet the above objective will have minimal erosion risk or maintenance requirements.*** ***• Prioritization of road decommissioning shall follow a hierarchy that protects watersheds with coho salmon or that provide salmonid refugia first (i.e. Elder et al., 2002)***

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
U.S. Forest Service & U.S. Bureau of Land Management	•U.S. Forest Service (USFS). •U.S. Bureau of Land Management (BLM). •Regional Water Board.	Continued from previous page. Contents Related to Grazing Activities: 11. A date for the completion of a description of grazing management practices and riparian monitoring activities implemented in grazing allotments on USFS/BLM lands. 12. A commitment by the USFS/BLM and the Regional Water Board to determine if existing grazing management practices and monitoring activities are adequate and effective at preventing, reducing, and controlling sediment waste discharges and elevated water temperatures. 13. A commitment by the USFS/BLM to develop revised grazing management practices and monitoring activities, should existing measures be inadequate or ineffective, subject to the approval of the Regional Water Board's Executive Officer. 14. A commitment by the USFS/BLM to implement adequate and effective grazing management practices and monitoring activities and to conduct adaptive management.	

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Grazing	• Private Parties Conducting Grazing Activities. • Regional Water Board	• The Regional Water Board encourages the parties responsible for grazing activities to take necessary actions to prevent, minimize, and control sediment waste discharges and elevated water temperatures. • The Regional Water Board's Executive Officer shall require parties responsible for grazing activities on private lands in the Scott River watershed to develop, submit, and implement a Grazing and Riparian Management Plan and a Monitoring Plan on an as-needed, site-specific basis. A Grazing and Riparian Management Plan shall describe, in detail, (1) sediment waste discharges and sources of elevated water temperatures caused by livestock grazing, (2) how and when such sources are to be controlled and monitored, and (3) management practices that will prevent and reduce future sources. By [insert date that is 2 years from the date of U.S. EPA approval], criteria shall be developed for determining when a Grazing and Riparian Management Plan shall be required, although nothing precludes the Executive Officer from requiring Grazing and Riparian Management Plans prior to this date. • Should human activities that will likely result in sediment waste discharges and/or elevated water temperatures be proposed or identified, through a Grazing and Riparian Management Plan or by other means, the responsible party(ies) shall be required to implement their Grazing and Riparian Management Plans and monitor through appropriate permitting or enforcement actions	***Proposed actions appropriate***

Table 1. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Topic	**Responsible Parties**	**Action Proposed in Public Draft TMDL**	**Recommended Alternative Action**
Siskiyou RCD & Scott River Watershed Council	• Siskiyou Resource Conservation District (SRCD). • Scott River Watershed Council (SRWC). • Regional Water Board.	• The Regional Water Board and staff shall increase efforts to work cooperatively with the SRCD and SRWC to provide technical support and information to landowners and stakeholders in the Scott River watershed and to coordinate educational and outreach efforts. • The Regional Water Board shall encourage the SRWC to (1) implement the strategic actions specified in the Strategic Action Plan and (2) assist landowners in developing and implementing management practices that are adequate and effective at preventing, minimizing, and controlling sediment waste discharges and elevated water temperatures.	***Proposed actions appropriate with the following addition:*** ***The Regional Water Board shall require that all water quality or trend monitoring studies conducted by the SRCD, SRWC or their consultants provide raw data, along with summary data and reports.***
Natural Resources Conservation Service	• Natural Resources Conservation Service (NRCS). • Regional Water Board	• The Regional Water Board shall increase efforts to work cooperatively with the NRCS to provide technical support and information to responsible parties and stakeholders in the Scott River watershed and to coordinate educational and outreach efforts.	***Proposed actions appropriate with the following addition:*** ***• The Regional Water Board will engage NRCS staff in discussions regarding response to flood damage to agricultural land and appropriate reach agreement on a plan of action.***
CA Dept. of Fish and Game	• CA Depart. of Fish & Game (CDFG). • Regional Water Board	• The Regional Water Board shall encourage the CDFG and aid, where appropriate, in the implementation of necessary tasks, actions, and recovery recommendations as specified in the Recovery Strategy for California Coho Salmon (CDFG 2004) in the Scott River watershed.	***Proposed actions appropriate with the following addition:*** ***• The Regional Water Board staff will work cooperatively with CDFG regarding coordination on shared authority such as stream bank and bed alteration that may affect water quality.*** ***• CDFG will be encouraged to provide Scott River fish trend monitoring data to Regional Water Board staff and coordinate on sediment studies in the Scott River canyon related to fall chinook salmon spawning success.***

* Although the Regional Water Board prefers to pursue the implementation actions listed in Table 4, the Regional Water Board shall take appropriate permitting and/or enforcement actions should any of the implementation actions fail to be implemented by the responsible party or should the implementation actions prove to be inadequate.
** Superior Court of Siskiyou County. 1980. Scott River Adjudication: Decree No. 30662.

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U.S. Environmental Protection Agency (USEPA). 1998b. Total maximum daily load for sediment - Redwood Creek, California. USEPA Region 9. San Francisco, CA. 72 pp.

U.S. Environmental Protection Agency (USEPA). 1998c. South Fork Trinity River and Hayfork Creek Total Maximum Daily Loads. California. USEPA Region 9. San Francisco, CA. 66 pp.

US Environmental Protection Agency (USEPA). 1999. (Final) Noyo River Total Maximum Daily Load for Sediment. USEPA, Region IX. San Francisco, CA. 87 pp.

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Ziemer, R.R. 1981. The role of vegetation in the stability of forested slopes. In: Proc. First Union of For. Res. Org., Div. I, XVII World Congress, Kyoto, Japan, 1981 September. Pp. 297-308.

Appendices

Appendix A: Groundwater levels in Scott Valley 1953-2004

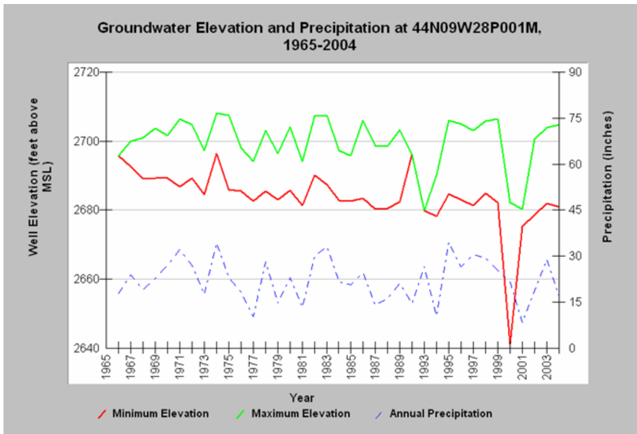
These figures and text were extracted from:
Quartz Valley Indian Community. 2005. Comments on Hypothesis Testing for Approach to Groundwater Studies, by Scott River Watershed Council – Water Committee. Quartz Valley Indian Community, Fort Jones, CA.

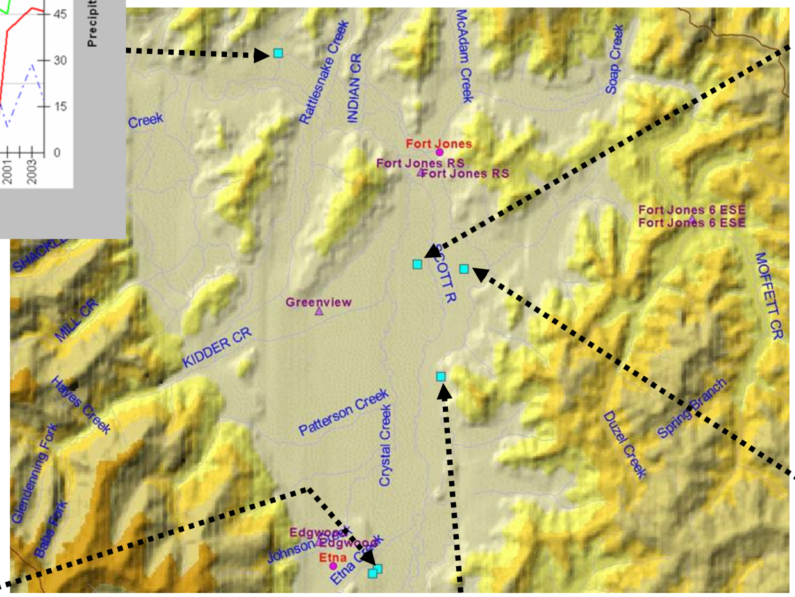
To obtain copies of the data on which these charts and maps are based, please contact Rebekah Sluss (EPA Director at QVIC) at rebekahqvir@yahoo.com or 530-468-5907.

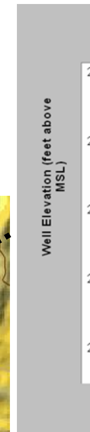
Preliminary charting of annual minimum/maximum levels in California Department of Water Resources monitoring wells in the Scott Valley suggests that annual maximum levels have remained relatively constant over time (fluctuating with precipitation), but that annual minimum levels have declined since 1965 (though they fluctuate with precipitation). See maps and charts below for details.
[Cautionary note: when constructing charts, all measurements were used (data points were not excluded based on QAQC information)].

Each chart displays annual minimum and maximum groundwater levels at a California Department of Water Resources monitoring well. Also displayed on each chart is annual precipitation at Fort Jones (rain gage F20 3182 00). Groundwater elevations were typically measured once or twice per year, but have been measured more often in recent years.

Scott Valley Groundwater Levels 1953-2004

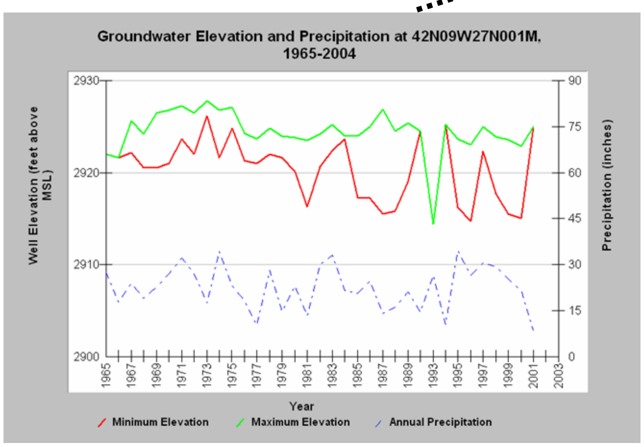


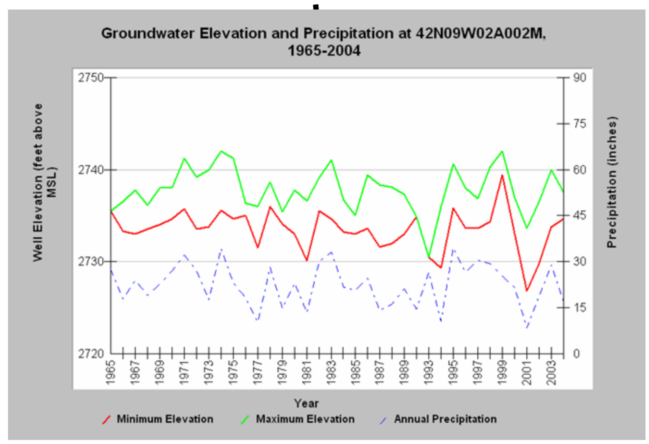


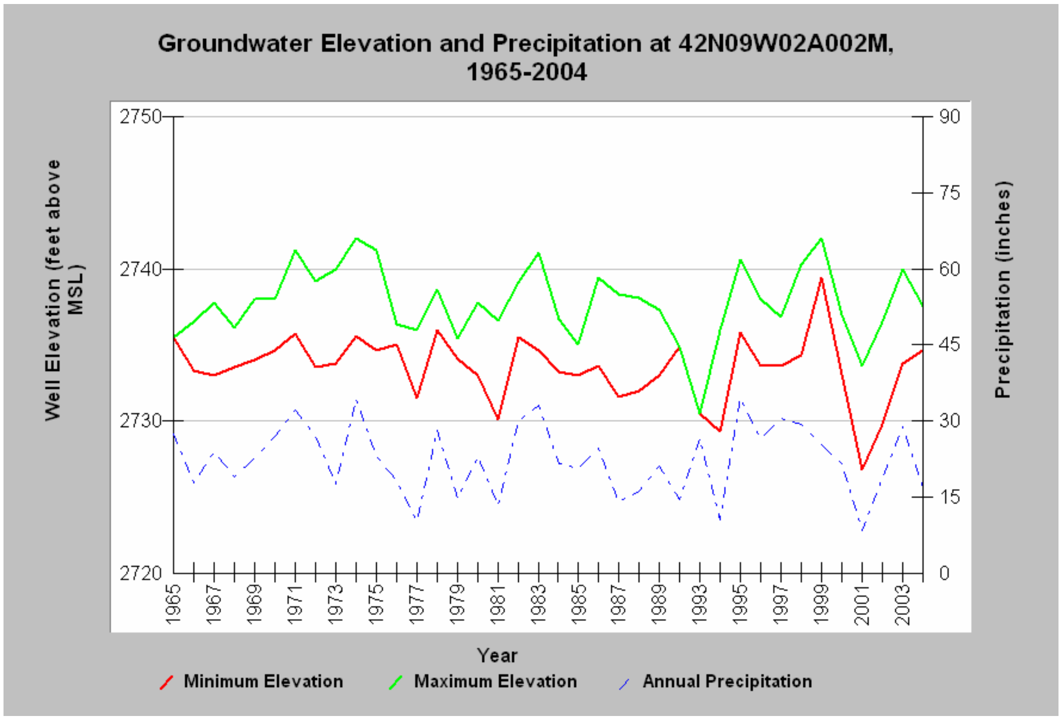


Groundwater data are from California Department of Water Resources Water Data Library - http://well.water.ca.gov/

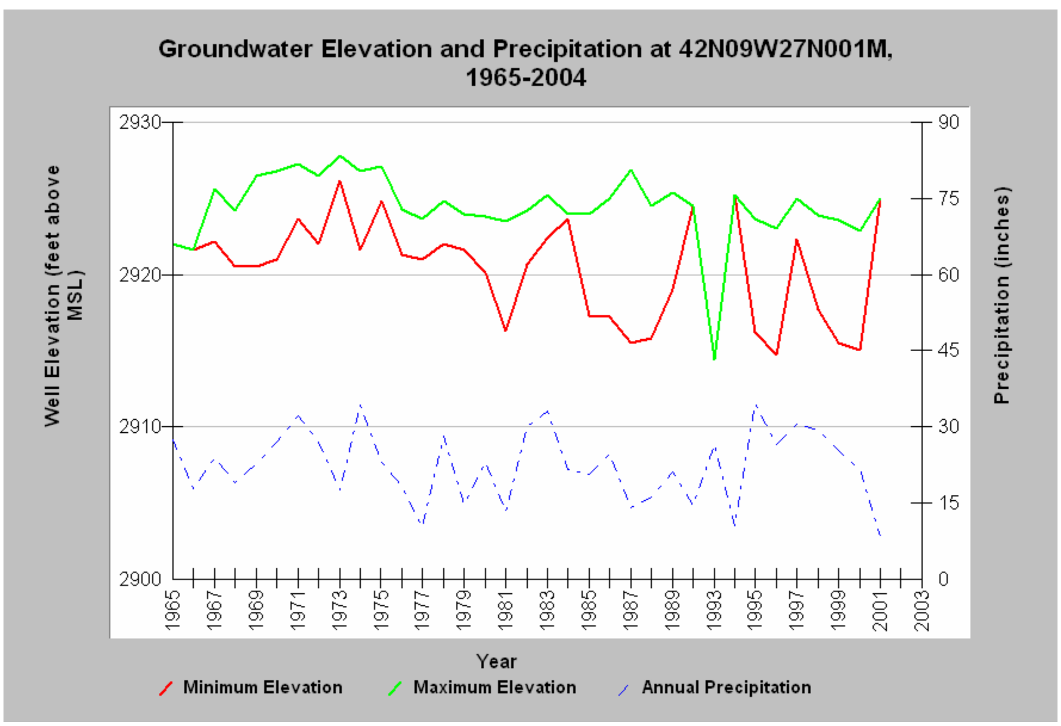
Precipitation data are from Fort Jones rain gage (F20 3182 00) California Data Exchange Center - http://cdec.water.ca.gov



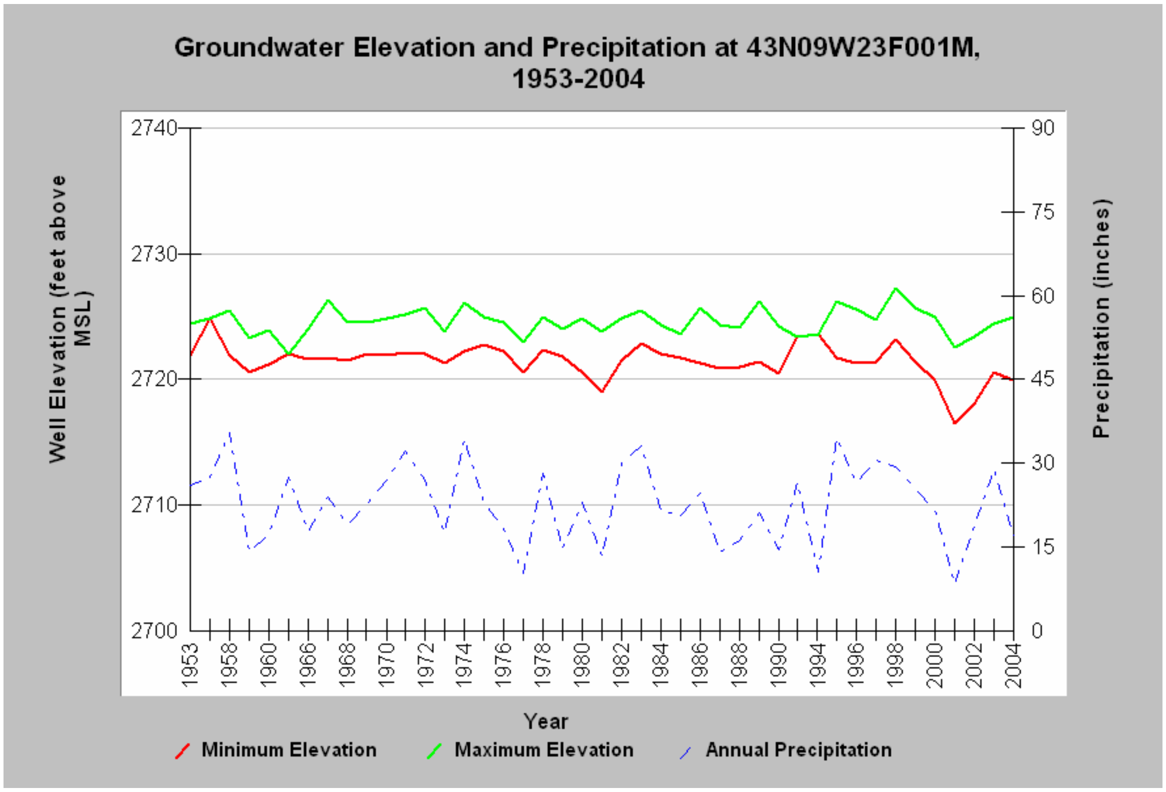




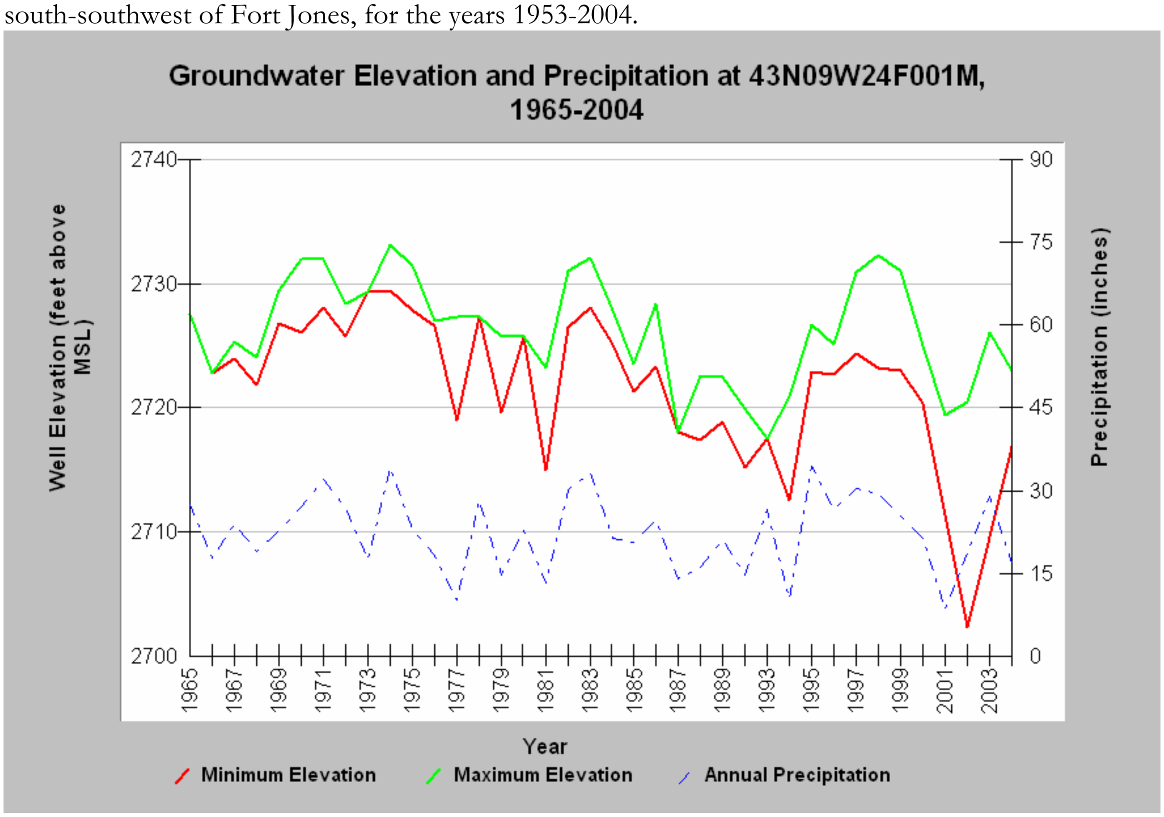
California Department of Water Resources well 42N09W02A002M, approximately 8 kilometers northwest of Fort Jones, for the years 1965-2004.



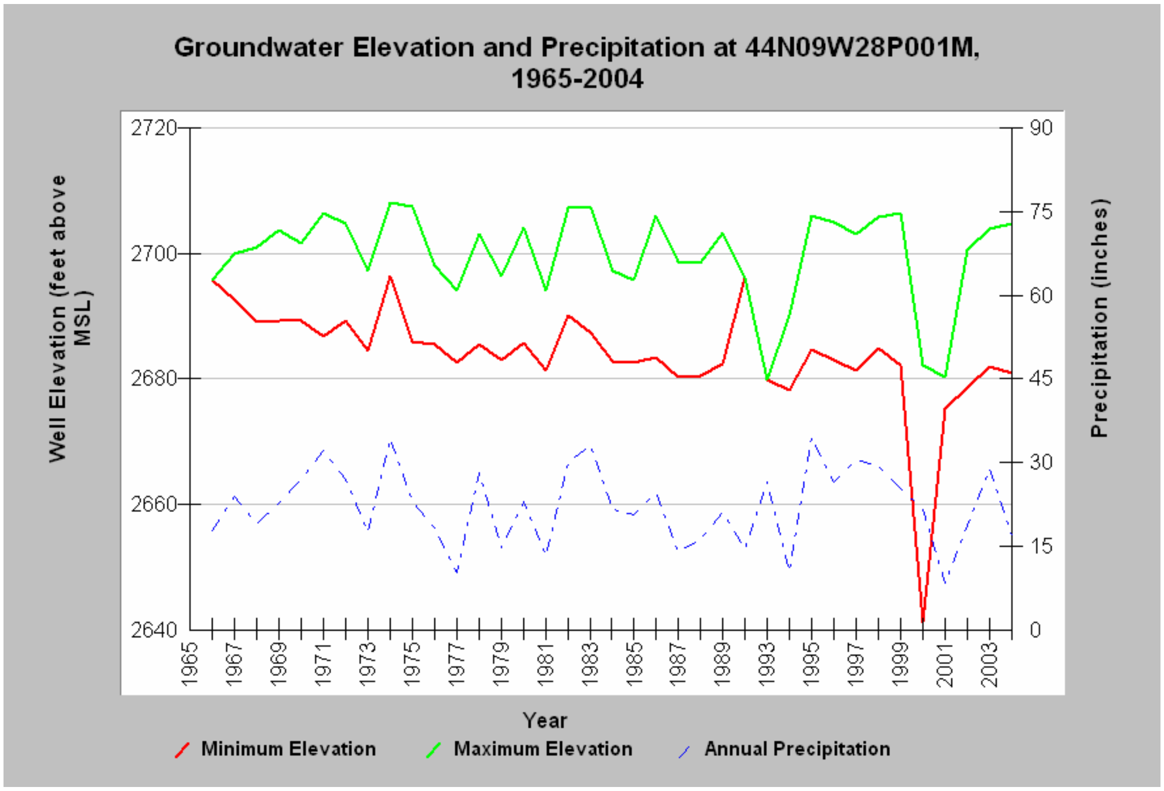
California Department of Water Resources well 42N09W27N001M, approximately 8 kilometers east of Etna, for the years 1994-2004.



California Department of Water Resources well 43N09W23F001M, approximately 5 kilometers south-southwest of Fort Jones, for the years 1953-2004.



California Department of Water Resources well 43N09W24F001M, approximately 5 kilometers south-southeast of Fort Jones, for the years 1965-2004.



California Department of Water Resources well 44N09W28P001M, approximately 8 kilometers northwest of Fort Jones, for the years 1965-2004.

COMMENT 4 - Appendix C

The Pacific Coast Federation of Fishermen's Associations (PCFFA), Institute for Fisheries Resources, Coast Action Group, Northcoast Environmental Center (NEC), Environmental Protection and Information Center (EPIC), Mendocino Group of the Redwood Chapter of the Sierra Club, and the Sierra Club of California

Chair Tam Doduc and Members of the Board
C/o Selica Potter, Acting Clerk of the Board
State Water Resources Control Board – Executive Office
1001 "I" Street, 24th Floor
Sacramento, CA 95814

12 June 2006
Via Email and Mail

Re: Joint Comments on the Proposed Action Plan for the Scott River Watershed Sediment and Temperature TMDL

Dear Board Members:

The Board's decision to adopt an Action Plan (Plan) for the Scott River Watershed Sediment and Temperature TMDL offers a tremendous opportunity. When it enacted the Porter-Cologne Water Quality Control Act, the Legislature assigned the State Board jurisdiction over both water quality and water *quantity* for the agency to take each into account when determining what pollutants may go in and what water may come out of a watershed. To date, the State Board's divisional structure and the sharp separation between the water quality and water rights divisions' proceedings and staffing has resulted in the regulatory distancing of water quality and water quantity issues for most of the State's rivers. Although the State's involvement in water quality certifications provided by the federal Clean Water Act, for example in dam licensing proceedings, have bridged the gap on occasion, those few occasions are very project specific, subject to the scheduling licensing proceedings, and include water quality issues only as a secondary issues. The TMDL proceedings currently underway around the state provide a much more integrated and timely opportunity for the State Board to realize Porter-Cologne's goals of integrating its water quality *and* water quantity management and assuring water quality standards and beneficial uses are attained as soon as possible for hundreds of degraded rivers and streams throughout the State.

Although many of the technical TMDLs produced for the North Coast region have identified sufficiently the sediment and temperature problems confronting rivers and creeks throughout that region, with the exception of the Garcia River, the Regional Board has failed to adopt any implementation plans specific to any of the other listed waterbodies. The Regional Board's failure appears to be a combination of lack of political will to confront the facts presented in these watersheds and, in regard to temperature issues, a lack of authority to directly address flows.

The Scott River Action Plan could be a model of how to integrate its water quality *and* water quantity responsibilities in a manner that reflects the natural connection between a river's flow volumes and the quality of that water rather than allow the Board's divisional structure to serve as a roadblock to effective implementation of needed regulatory requirements.

c/o The Klamath Basin Coalition, PO Box 1375, Eugene, OR 97440
(541)689-2000, Fax: (541)689-2500, Email: klamathcoalition@aol.com
Web Page: www.klamathbasin.info

Unfortunately, the proposed Plan does not contain sufficient enforceable actions to protect public trust and beneficial water uses, including fisheries protections, in the Scott River. In light of the ongoing collapse of Klamath River salmon resources, and ample evidence that particularly for state and federally ESA-listed coho salmon these issues are particularly important in the Scott River, the Plan needs measurable and definite actions that the State can apply to reduce controllable temperature and sediment pollutants. Temperature pollution in particular needs to be reduced to achieve applicable water quality standards, and thus restore protected beneficial uses.

The most egregious and indefensible omission in the current proposed Implementation Plan (the "Plan") is the failure to recognize the nexus between increasing water use (surface and groundwater) and declining instream flows that have led to temperature impairment throughout the Scott River watershed.

Reduced surface flows and elevated water temperatures are significant factors in the decline of the Scott River's anadromous salmonid fisheries, particularly state and federally protected coho salmon (see ATTACHMENT A). The Plan should confront the problem of temperature impairment and address the need for adequate instream flows for the Scott River and its tributaries to enable the recovery of at-risk anadromous salmonids.

Diminished flows in the Scott River are clearly linked not only to temperature impairment but also to the concentration of chemical pollutants, low dissolved oxygen (DO) levels, and high nutrient levels. The almost completely unenforceable voluntary actions proposed in the Plan are not consistent with the State and Basin Plan's Anti-degradation Policy which applies to all waters of the state, including ground water; specifically it is the State's responsibility to regulate land use activities that may reasonably be controlled, such as surface diversions, ground water pumping, grading, clearing riparian habitat, and grazing, which singly or cumulatively influence the quality of waters of the State.

General TMDL Comments:

The Regional Water Board needs to develop/adopt a Temperature TMDL Implementation Policy similar to its Sediment TMDL Implementation Policy that identifies what actions the Board will take to control activities that elevate water temperature, resulting in non-attainment of water quality standards.

The State Water Resources Control Board (SWRCB), in addition to its Regional Boards, are also charged by the federal Clean Water Act and California Porter-Cologne Act to control waste discharges and ensure attainment of water quality standards.

Porter-Cologne does not allow mere voluntarism (which by its very nature is uncertain and unreliable as well as unenforceable) as the means for the Boards to address discharges of pollution to the State's waters. Porter-Cologne provides three primary tools to the SWRCB and RWQCBs to control any waste discharges to waters of the State, including the Scott River, and assure attainment of water quality standards. These three tools are: 1) waste discharge requirements, 2) conditional waivers of waste discharge requirements, or 3) discharge prohibitions.

In addition to these three fundamental regulatory tools, Porter-Cologne allows for additional layers of activity to supplement the regulatory scheme, including funding provisions, voluntary actions, guidance authority, etc. However, in no case do any of these additional authorities supplant the three options the Board must turn to when pollution is being discharged. Every discharger of the state, large or small, good or bad, simple or complex, must report its waste discharge to the applicable Regional Board. The Regional Board then must take one of the three required actions. The choice of action and the appropriate regulatory conditions to be included can then take into account the severity (or lack thereof) of any reported discharge. But, as a matter of law, one of these three basic tools must be used wherever a discharge is occurring.

The three fundamental regulatory tools described above are recognized by the State Board's existing Nonpoint Source Policy. The tools available to the Boards are no different when developing a TMDL implementation plan. Every TMDL implementation plan must employ the three categories for every pollutant source identified by the TMDL. Every TMDL implementation plan must be consistent with the State Board's Nonpoint Source Policy.

Similarly, the Legislature delegated to the State Board the authority to regulate water diversions, including the regulation of bypass flows and enforcement of diversion limitations via water rights licenses. Given the State Board's authority over all activities affecting water quality and quantity in any given waterbody, it would be antithetical to the goals of Porter-Cologne not to integrate these two components of ecosystem health into proceedings purporting to address impairments to that health right now.

However, where an implementation plan attempts to justify holding any of these three mandated water quality tools (WDRs, Conditional Waivers or Prohibitions) or the State Board's water quantity tools at bay, based on mere speculations of the efficacy of future voluntary efforts or future potential challenges of any water right proceedings, this turns "implementation" into hesitation. Instead of eliminating pollution problems, such a plan simply institutionalizes them.

Comments on the Action Plan for the Scott River Watershed Sediment and Temperature TMDL

The Plan identifies several implementation actions that the Regional Board believes will achieve sediment and temperature TMDL, and thus meet minimum water quality standards. However, it will take higher standards than just meeting the minimum to actually recover the Scott River's beneficial uses such as those that support its anadromous salmonid resources. The Scott River has been classified as impaired now for nine to fourteen years; the Plan expects another forty years to attain water quality standards, yet no quantifiable goals nor targets have been identified in the Plan for instream flows, temperature, or sediment. Some beneficial uses that support recovery of state and federally listed anadromous salmonid populations (RARE) simply cannot wait until 2046. Entire generations of citizens will be denied their right to enjoy the Scott River's un-impaired beneficial uses: (REC-1, REC-2, COMM, COLD, RARE, MIGR, and SPWN).

Additionally, at least 13 three-year lifecycles of coho salmon will pass between now and 2046, with ESA-listed coho continuing at risk of extinction throughout that period. Threatened salmon runs may well go extinct long before those 40-year goals are ever attained. More aggressive achievement goals are more than warranted, they are required by law. Adoption of a Plan that fails to attain water quality standards until 2046 violates federal and state Endangered Species Act prohibitions on "take" of protected species such as listed salmonids and the degradation of designated critical habitat.

The Plan fails to adequately address the issue of excessive consumption of water, thus its adoption will merely legitimize all the existing uses that currently degrade instream habitat and minimum flow needs of salmonids, and are detrimental to the recovery of these species. Likewise the Plan fails to require pro-active and enforceable measures to protect and restore federally designated critical riparian and aquatic habitats, including by excluding grazing in these critical habitats.

The proposed Plan will be an amendment to the Basin Plan; therefore, it must meet requirements of water quality control plan statutes, particularly Section 13242 of the CA Water Code. In order for the Plan to achieve both narrative and numeric water quality objectives, it must at a minimum include: (1) a description of what actions will implemented; (2) when those actions will be implemented, and; (3) how compliance with the objectives will determined. The proposed Plan relies excessively on actions that are by their very nature entirely unenforceable because they are entirely voluntary implementation actions delegated to entities other than to the Board, which is inconsistent with State water law. Encouraging voluntary actions is commendable, but they do not supplant the Boards' obligations to issue either WDRs, conditional waivers (where appropriate) or prohibitions, and cannot be effective unless there are definitive standards and goals to be met.

Comments on the Plan's Proposed Actions to Achieve Temperature TMDL

The Plan's temperature source analysis identifies three controllable anthropogenic activities that adversely affect water temperature: stream shade, stream flow, and stream channel geometry or morphology. Yet, the Plan provides no facts to support its unsupported finding that reductions in stream flow have only a small temperature impact and that reduction of shade is the primary cause of increased water temperatures in the Scott River. There is in fact considerable scientific evidence and monitoring data that shows that reductions in flows throughout the Scott River have had a far greater impact on water temperatures than the Plan acknowledges (see ATTACHMENT A).

The Plan also does not address the severity of direct or indirect impacts of anthropogenic changes to stream morphology on water temperature. These impacts too can be severe.

The Plan's implementation actions, to protect or restore effective shade to achieve temperature TMDLs, reference the State's Nonpoint Source Policy (NPS) to develop and take appropriate permitting and enforcement actions to address human-caused removal and suppression of vegetation that provides shade to a water body. The NPS Policy relies on the three regulatory tools provided by Porter-Cologne – WDRs, conditional waivers of WDRs, or prohibitions - to regulate all current and proposed nonpoint sources of stormwater pollution. The Plan should declare that all current and future nonpoint sources of pollution, regardless of the affected acreage, will be required to secure WDR permits, conditional waivers, and/or be subject to a Basin Plan prohibition, or be subject to its enforcement actions via cease and desist or cleanup and abatement orders. These are the only legal options available under California water law. In contrast to the proposed Plan, the word "voluntary" is not in the lexicon of the NPS, and the Plan and SWRCB should be in conformance with this NPS Policy.

The Plan's focus on the relationship of shade to water temperature completely ignores the excessive diversion of surface flows and pumping of groundwater. Both activities are controllable. The connection between flow and temperature is well established and is in no way controversial. The State has long failed to adequately regulate surface water diversions and bypass flows in the Scott River pursuant to its own Water and Fish & Game Codes, allowing conditions in the river to deteriorate; these laws must now be aggressively enforced if this deterioration is to be reversed. Adequate flow standards for each life-cycle of salmonids are needed throughout the Scott River Basin (for example to ensure spawning flows in areas where spawning occurs). The Board should have the Division of Water Rights study the impacts of surface water diversions on water temperature, fisheries, aquatic life and riparian vegetation in the Scott River Watershed, and establish adequate flow needs, particularly during critical low flow periods. This is a state responsibility: it cannot be delegated to the County, which is ill equipped to make such an analysis.

An analysis of the best available scientific information will lead to the finding that flows and temperature in the Scott River have been severely compromised by surface diversions and an increasing number of groundwater pumping projects for irrigation. It is highly likely that the sustainable draw levels of the local aquifers have been exceeded. The Board should request that the County declare a moratorium on new well drilling and well deepening in the Scott Valley bottoms pending further studies to ascertain if this is the case. Again, these studies are the responsibility of the State – the County has neither the expertise, funding, nor the inclination to conduct such studies.

The Board should also request that the County, through its General Plan and Zoning Ordinance, better regulate agricultural uses and the density of wells by land use/zoning districts to protect instream flows and thus water temperature. The rate of decline in flows in the Scott River at the USGS gauge below Scott Valley has accelerated during the period of record 1950-2000. The decline in flows corresponds closely to an increase in the number of irrigation wells and increased consumptive irrigation water use throughout this same period.

In other words, the Scott River is being incrementally dewatered through excessive and unregulated groundwater pumping. The Board should have the Division of Water Rights study the impacts of ground water use on water temperature, fisheries, aquatic life and riparian vegetation in the Scott River watershed, and establish adequate minimum instream flows throughout the watershed.

The Board should also re-examine all existing water rights for stream diversions for adherence to the terms regarding bypass conditions and compliance with Statements of Use, and correct any non-compliance, particularly diversions in excess of license conditions. Both monitoring and enforcement have been lax in the Scott River watershed for some time, and water permit violations are very common. The Scott River Adjudication must be enforced, particularly quantity and period of diversion (for example it states that irrigation is to end about October 15th yet in practice it does not).

The Board should review the record for compliance with the terms of the Adjudication for diversion and bypass requirements, and take appropriate enforcement actions in cases of non-compliance or usage in excess of license conditions. Surveys of other similar watersheds have disclosed more un-permitted diversions than permitted diversions. The continued decline of summer flows since the adjudication indicates that same pattern exists on the Scott. The watershed should be surveyed for un-permitted diversions or impoundments and enforcement actions taken to correct illegal diversions. Landowners who are in compliance should not be penalized by allowing those who are not to continue illegal uses. The Board should also reopen adjudication and reallocate water rights, as necessary, to achieve water quality standards and restore beneficial uses, including instream minimum flow protections for ESA-protected salmonids, in the Scott River Watershed.

Ultimately, the Plan has no goal, for it does not provide a measurable water temperature TMDL standard that it will use to determine the effectiveness of its implementation measures even in 40 years. The Plan must not only have a goal but it must require that the Scott River watershed have an adequate number of stream gages to continually monitor discharge, temperature, turbidity, and verify whether instream flow and temperature goals are being achieved.

Enforcement of violations of the Plan cannot be limited as proposed to enforceable restrictions contained in new water quality certifications or WDR permits, but must require certifications and WDRs or appropriate conditional waivers for existing uses that are contributing to the impairment of two water quality attributes: temperature and sediment. Enforcement of the Plan must parallel the Endangered Species Acts prohibition on "take" of listed species, since many pre-existing land uses clearly impair the Scott River. Achieving TMDL Action Plan objectives or attaining water quality standards for temperature and sediment is not possible if existing activities that degrade water quality simply are allowed to continue.

Comments on Other Proposed Actions

The Plan identifies twenty implementation actions. Unfortunately, few contain regulatory or physical recommendations that the Board can implement to achieve sediment or temperature TMDLs, and more importantly, reach minimum thresholds for water quality standards, which mean achieving beneficial uses or Basin Plan objectives. The majority of the implementation actions simply encourage others to take actions or to engage in planning exercises or management agreements such as MOUs. Thus these many voluntary actions sought in the Plan are unenforceable, and therefore inconsistent with Cal. Water Code Section 13242, as these examples demonstrate:

- Roads: The Plan's implementation action for roads at the County level is restricted to merely encouraging the County to address their roads issues but does not address problems with the far more numerous private roads. The Board should inform the County that their General Plan and Zoning Ordinance are not in compliance with the proposed Plan or the Basin Plan, and require that the County develop and adopt by a date certain a comprehensive grading ordinance for roads, including land disturbances activities inclusive of clearing vegetation, and grading. The Board should set a date to issue county-wide WDRs or federal NPDES permits to the county and private roads. Many of the discharges associated with these roads are through point source discharges. For example, Caltrans roads currently are regulated through a NPDES permit. The road WDRs/permits should set forth necessary road construction and maintenance conditions, including other land disturbances activities inclusive of clearing vegetation, and grading and taking into account cumulative impacts of road sin the watershed.

- Dredging: The implementation action for dredging is one of the few that the Board itself will implement if necessary; DFG already regulates such activities.

- Water Use: If no study as proposed is undertaken then there is no implementation action addressing the most significant and controllable adverse impact to water quality: water use.

- Flood Control & Bank Stabilization: The over-reliance on WQC via a federal nexus with the Army Corps of Engineers to control water quality impacts from flood control or bank stabilization activities will fail to prevent the removal or suppression of stream-side vegetation, which is an activity that is rarely subjected to federal regulatory oversight. In fact, clearing vegetation is often mandated in federally funded/constructed flood control projects, in which case riparian vegetation is not protected. These activities should be addressed in appropriate WDRs or conditional waivers. The Plan should set forth a timeline for developing such WDRs or waivers.

- Grazing: The Plan's action for grazing again relies on simply encouraging others to act, yet the Plan should require that cattle be excluded from riparian areas, and that degraded riparian corridors be restored along the tributaries and mainstem of the Scott River. The Plan needs a more definitive description of desired near-stream conditions with a description of specific actions that can achieve these conditions within finite time periods. The Plan should require that the County adopt a stream management ordinance to regulate all land uses within a specified stream management zone, and that all such uses regardless of the acreage affected be required to secure WDRs or conditional waiver).

- Federal Agencies: The Plan proposes no actions to develop an MOU to coordinate regulation of activities with NOAA Fisheries to protect designated critical habitat pursuant to the federal Endangered Species Act nor essential fish habitat pursuant to the Magnuson-Stevens Fishery Management Act.

- CDFG: Lastly, the Plan should develop an MOU with DFG to inventory the Scott River and its tributaries to locate existing water diversions, determine bypass flow needs, assess whether present rates of diversion create low flow barriers to migration of anadromous salmonids, and to implement/apply the Coho Recovery Strategy Guidelines in the Scott River watershed. The Coho Recovery Strategy Guidelines and measures were developed with considerably Scott River watershed stakeholder input and approval, and should be incorporated into and/or coordinated with actions in the Plan.

Conclusion

The Clean Water Act charges the State with ensuring that necessary actions are taken to meet water quality standards and restore beneficial uses in the Scott River Watershed. Both the federal and state ESA listings of Scott River coho salmon also require similar actions, as does the CESA Coho Recovery Strategy long since adopted by the Fish and Game Commission.

In the 1983 Mono Lake case, the federal court stated that the Public Trust Doctrine requires the state to exercise continual supervision whenever feasible to protect the public's right to use and enjoy the State's waters and their associated resources. The Plan as proposed will cause significant adverse impacts to the distribution and abundance of state and federally protected anadromous salmonids in the Scott River watershed. This is a resource that many in-river Tribal communities, and many coast fishing ports, depend upon for their sustenance and livelihoods.

Further, the Plan as currently proposed will significantly reduce the probability of recovery of these already seriously depressed salmonid species because it fails to provide or protect adequate instream flows, improve elevated water temperatures, or restore/protect riparian corridors.

Lastly, the public's ability to enjoy the waters of the Scott River for recreation are significantly threatened by health risks associated with toxic algae blooms now proliferating throughout the Klamath River in waters with elevated temperatures. Deteriorating water quality in the Scott River, much of it triggered by decreasing instream flows, can only encourage the growth of these toxic algae species, posing a serious health risk to members of the general public.

In short, the Board must request an Action Plan where the State establishes adequate flows and regulates controllable consumptive water uses, and land disturbance activities that impair water quality if it wants to restore beneficial uses which are Public Trust uses in the Scott River.

Please make these comments part of the public record in this proceeding, and we hope they will be helpful to Staff as they prepare their recommendations.

Sincerely,

Glen H. Spain, J.D., for the Pacific Coast Federation
of Fishermen's Associations and the Institute
for Fisheries Resources, and the organizations below:

Coast Action Group
By Alan Levine, Executive Director

Northcoast Environmental Center (NEC)
By Tim McKay, Executive Director

Environmental Protection and Information Center (EPIC)
By Larry Evans, Executive Director

Mendocino Group of the Redwood Chapter of the Sierra Club
By David Myers, Water Committee Chair

The Sierra Club of California
By Paul Mason, Legislative Representative

Enclosed: Attachment A: Scott TMDL Related Data, Photos and Maps Regarding Flow and Temperature Problems

ScottTMDLJointLtr06-12-06.doc

Attachment A

Scott TMDL Related Data, Photos and Maps Regarding Flow and Temperature Problems

Below are summary charts, photos and map images that provide support for arguments regarding the impact of diminished flows in the Scott River basin as follows:

1. Flows have been progressively decreased by ground water extraction;
2. Flows have declined to far below those required by the Scott River Adjudication and now often cause stream reaches and tributaries to go dry;
3. Low flow exacerbates water temperature problems, and;
4. Flow and temperature problems combine with sediment to severely limit productivity of salmon and steelhead populations.

Scott River salmon and steelhead stocks are at high risk of extinction and evidence is presented herein to demonstrate the need for immediate action to prevent loss of locally adapted salmonid populations. This is only a sampling of such supporting data, which is voluminous, but of which only this small portion could be included herein.

Data are from the California Department of Fish and Game, California Department of Water Resources, U.S. Geologic Survey, Siskiyou Resource Conservation District, U.S. Forest Service, North Coast Regional Water Quality Control Board and private contractors. These data along with photos and maps were often extracted from the Klamath Resource Information System Version 3.0, which is also available on-line at www.krisweb.com.

Ground Water Pumping and Lack of Sufficient Scott River Flows

The *Long Range Plan for the Klamath River Basin Conservation Area Fishery Restoration Program* (Kier Assoc., 1991) noted that ground water pumping in the Scott River valley depleted surface flows because of interconnections between surface and ground water. This fact was also clearly noted in the *Scott River Adjudication* (CSWRCB, 1980) and by earlier work by the U.S. Geologic Survey (Mack, 1958).

California Department of Water Resources (CDWR) unpublished well log data (Eaves, personal communication) indicate that installation of irrigation wells continues in the Scott River Valley (Figure 1). Data show that the highest number of wells installed occurred from 1971-1980. After a decrease in installations between 1981 and 1990, well construction resurged during the 1990's and continues to the present. Not all well installations are reported and CDWR estimates their records may be 30-50% low as a result. Data from 2005 and 2006 have not been recorded and data from 2001-2004 is provisional.

Long term flow records show a substantial decrease in surface flows at the USGS flow gauge at Fort Jones after the number of ground water pumps began to increase in the 1970's. Figure 2 shows the number of days by water year that flows in the Scott River fell below 20 cubic feet per second. The pattern in the data shows that before ground water pumps were installed river flows rarely fell to this level, but that now there are sometimes more than 100 days/year with average flows less than 20 cfs. Probably the most telling pattern is the high number of days with extremely low flows even in years with moderate rainfall. Rainfall data by which water years are grouped are based on the California Data Exchange Center gauge in Fort Jones.

Kier Associates (1991) pointed out that the *Scott River Adjudication* allotted instream water rights to the U.S. Forest Service as a riparian owner for its lands downstream of the valley

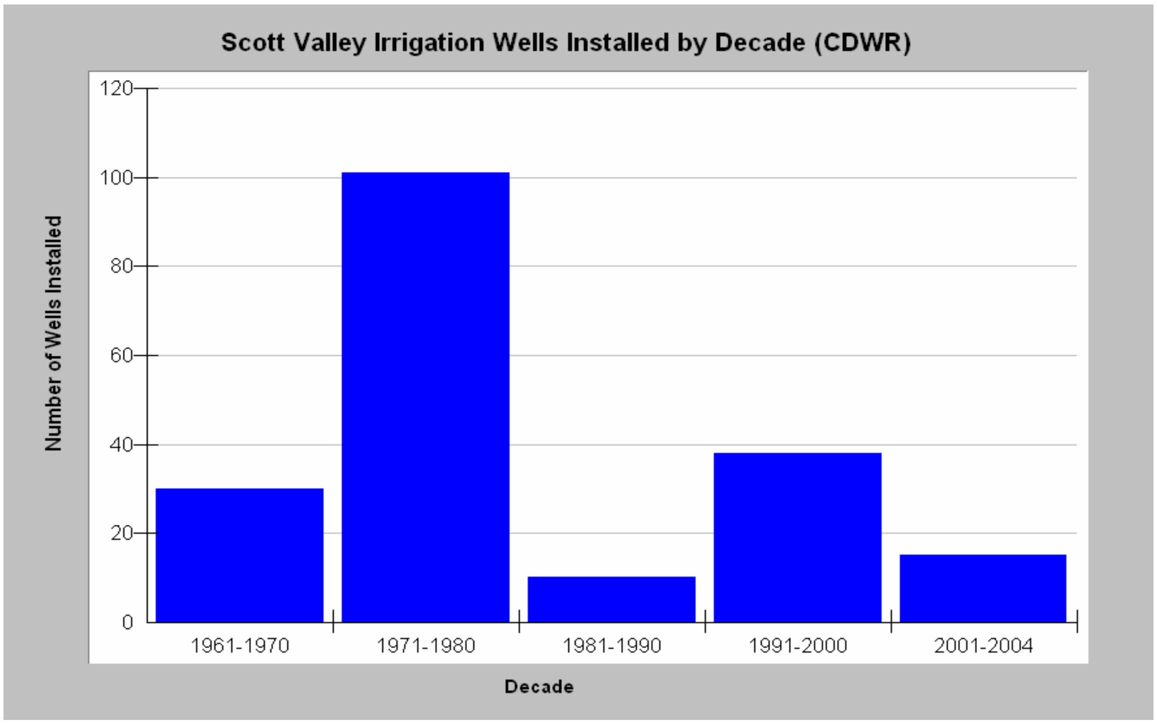


Figure 1. This chart shows the number of irrigation wells recorded by the California Department of Water Resources (Eaves, personal communication).

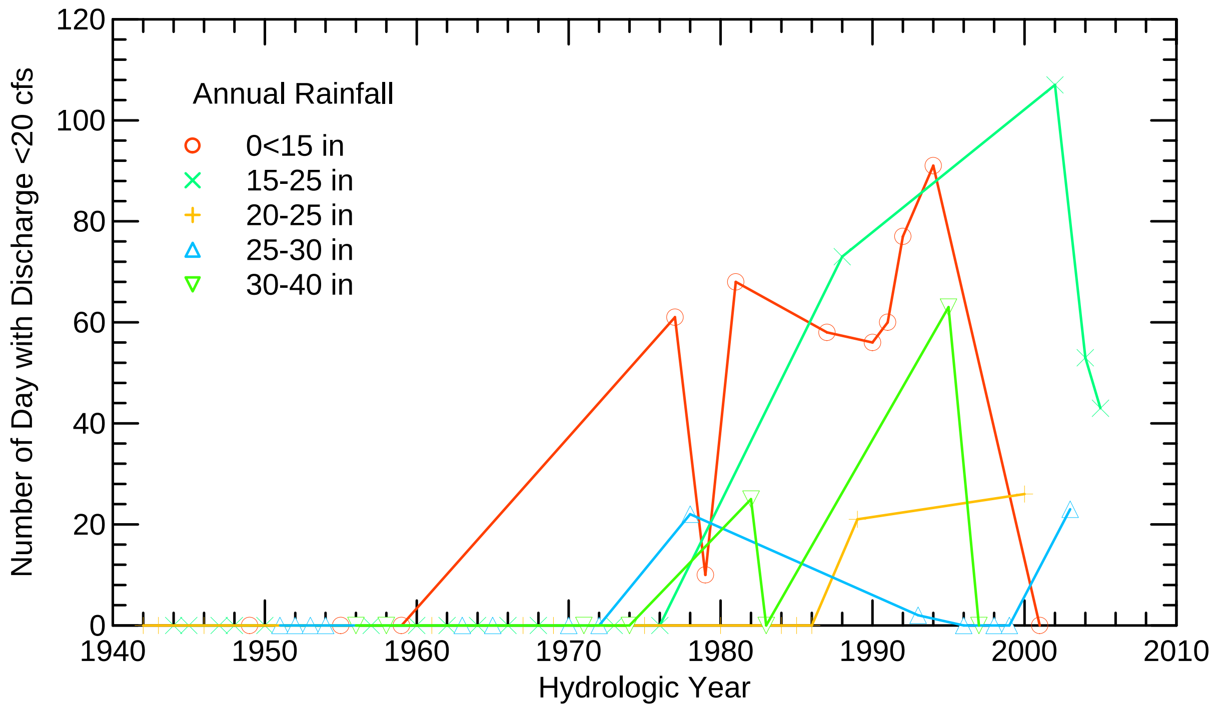


Figure 2. USGS flow gauge data are the basis for this chart showing the number of days/yr. with flows less than 20 cfs at Jones Beach in the lower Scott River. Annual rainfall from Ft. Jones CDEC gauge allows identification of associated rainfall in various years.

(CSWRCB, 1980) as shown in Table 1. "These amounts are necessary to provide minimum subsistence-level fishery conditions including spawning, egg incubation, rearing, downstream migration, and summer survival of anadromous fish, and can be experienced only in critically dry years without resulting in depletion of the fishery resource."

Table 1. Scott River Adjudication instream flow allotment for U.S. Forest Service needs for instream flow in Scott River canyon (CSWRCD, 1980 as cited in Kier Assoc., 1991).

Period	**Flow Requirement in Cubic Feet per Second**
November – March	200 cfs
April - June 15	150 cfs
June 16 - June 30	100 cfs
July 1 - July 15	60 cfs
July 16 - July 31	40 cfs
August - September	30 cfs
October	40 cfs

Flow records from summer periods in 2002 and 2004 are charted against low flow allotments for the U.S. Forest Service in the *Scott River Adjudication* in Figure 3 and Figure 4, respectively. These data show that the requirements of the adjudication are not being met, thus greatly decreasing carrying capacity for salmonids in the Scott River canyon and jeopardizing their future existence. This important habitat area has until recently served as a refugia for juvenile salmonids during summer when many reaches of the Scott River in Scott Valley and tributaries lack surface flow (see De-Watering section). Low flow conditions exacerbate water temperature problems throughout the lower Scott River (see Temperature section).

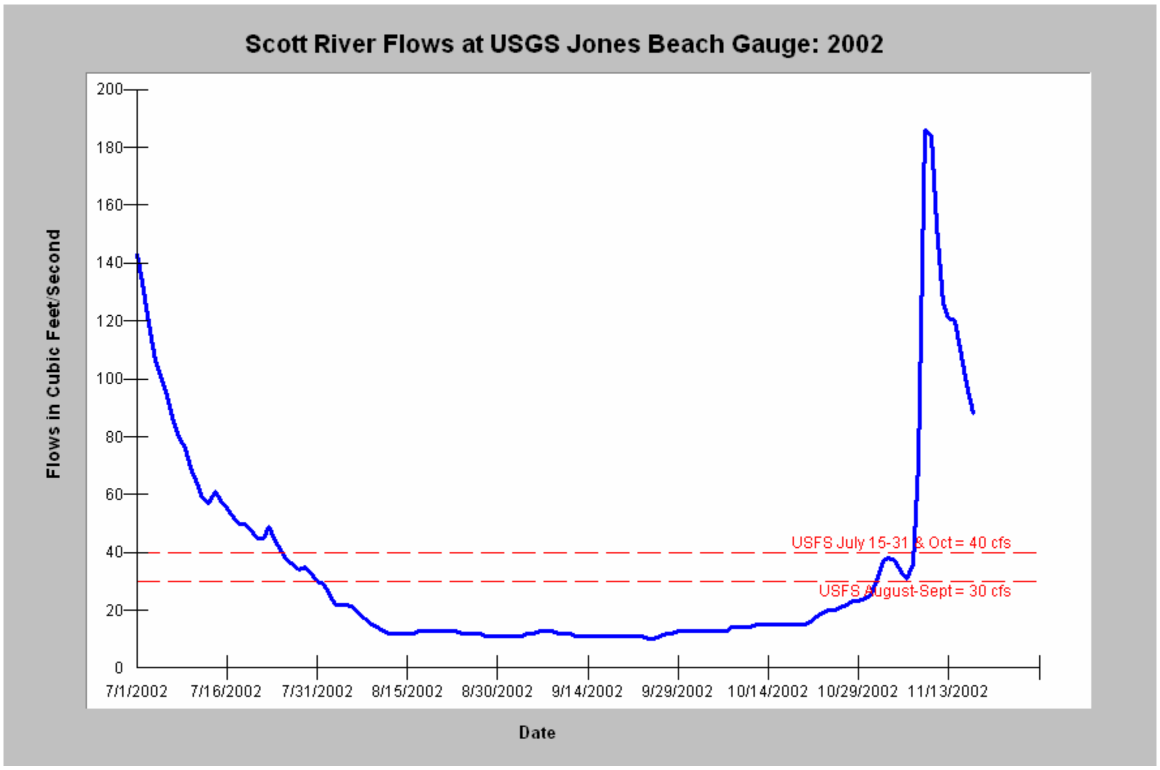


Figure 3. Jones Beach USGS flow gauge data from the irrigation season of 2002 show that flows failed to meet adjudicated levels for the USFS and flows needed for fish migration, spawning and rearing in August, September and October.

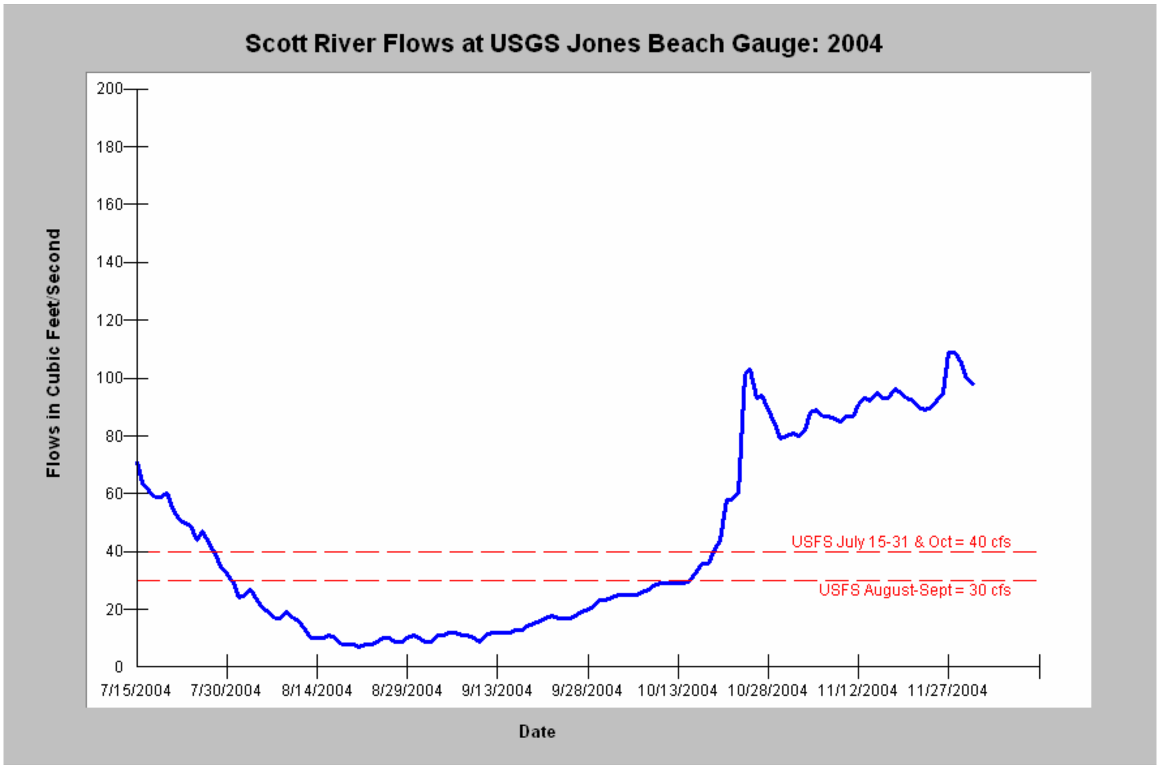


Figure 4. Jones Beach USGS flow gauge data from the summer and fall of 2004 show that flows failed to meet adjudicates levels for the USFS and flows needed for fish migration, spawning and rearing in August, September and the first half of October.

CDWR well data show a pattern of decline of minimum ground water levels over the last several decades as a greater number irrigation wells were installed. Figures 5 and 6 show the annual minimum and maximum measurements at a well, along with annual precipitation at the Fort Jones rain gage. The charts suggest that while annual maximum levels have remained relatively constant over time, annual minimum levels have declined since 1965, although they fluctuate with precipitation. Decreased ground water levels are likely linked to reduced cold water inflows into the Scott River.

De-Watering of Mainstem Scott River Reaches and Major Tributaries

While flows are often too low in the canyon of the Scott River, surface flows are sometimes completely lacking in mainstem reaches in Scott Valley and in tributaries that harbor salmon and steelhead. Photographic evidence from the KRIS project documents the loss of summer surface flow in numerous stream reaches, completely negating their ability to support cold water fisheries and other beneficial uses.

Mainstem Scott River reaches often go dry in irrigation season, such as the reach near the airport shown in Figure 7 in a photo taken by Michael Hentz in summer 2002. A photo from the same year near Fort Jones shows very little water in the Scott River channel below Highway 3. The photo also shows a stream bed with extremely fine average particle size distribution, an indication of recent sediment contributions and aggradation. Massive aggradation of some stream beds in the Scott River contributes to decreased available surface flow or complete loss of flow in some cases.

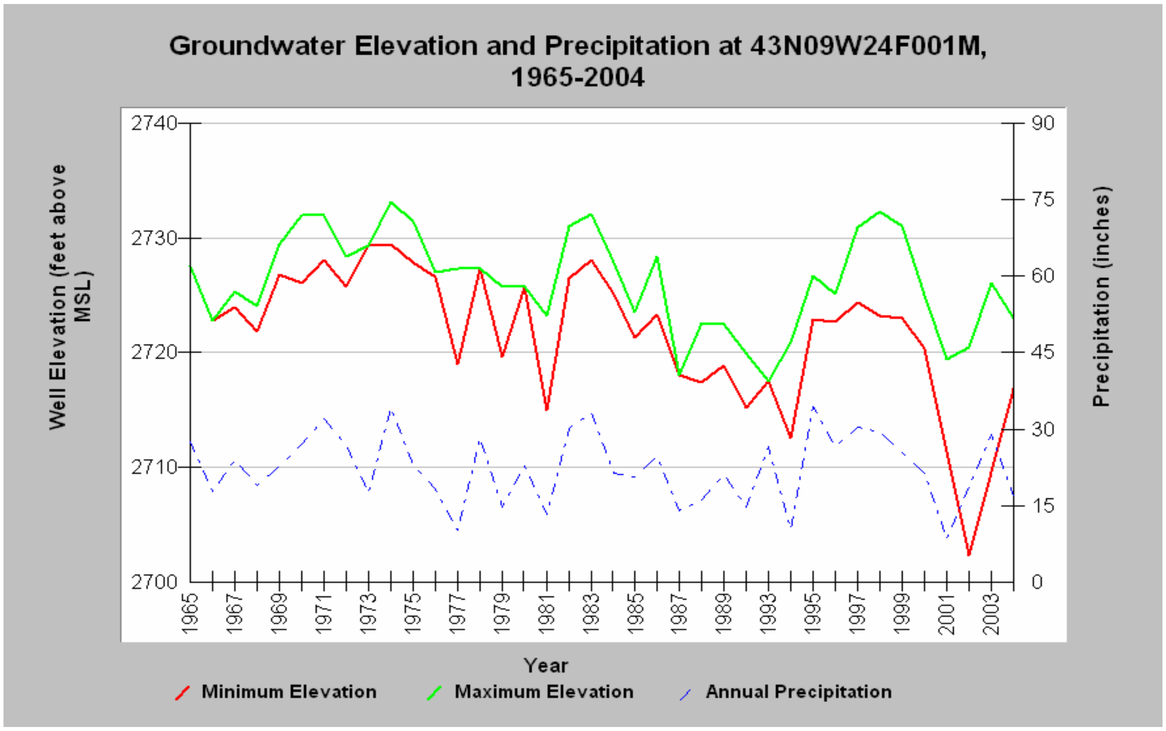


Figure 5. Department of Water Resources well 43N09W24F001M, approximately 5 kilometers south-southeast of Fort Jones, for the years 1965-2004.

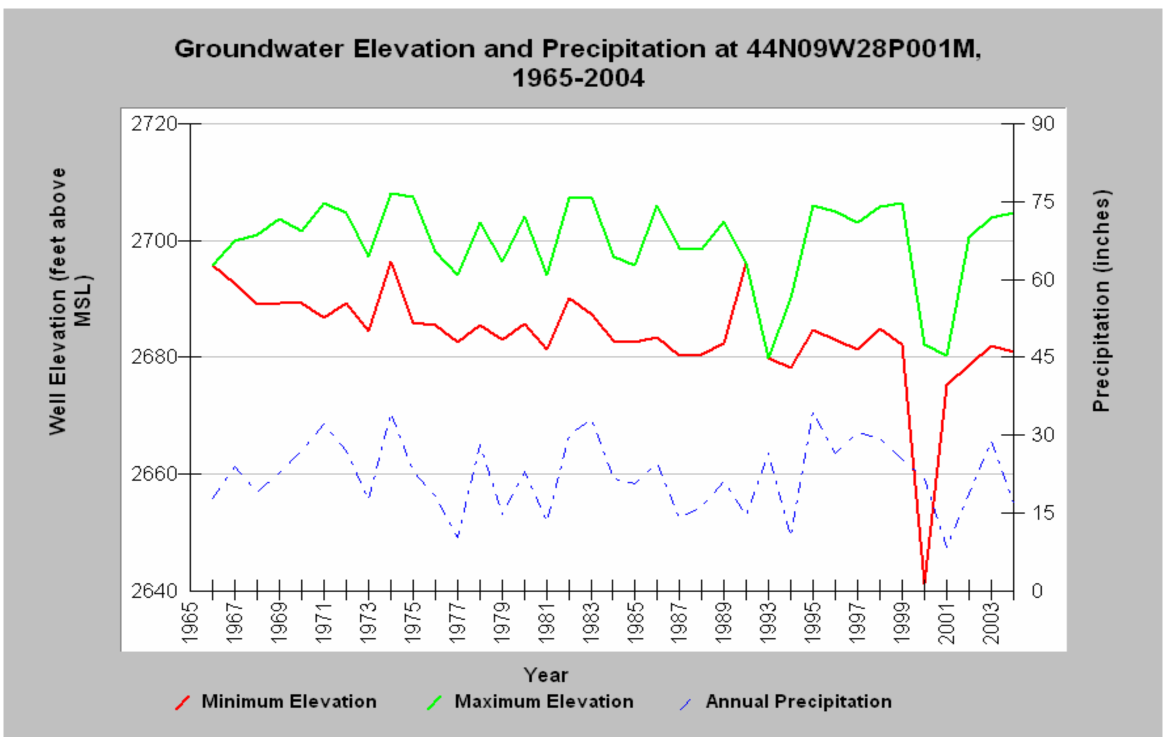


Figure 6. California Department of Water Resources well 44N09W28P001M, approximately 8 kilometers northwest of Fort Jones, for the years 1965-2004.

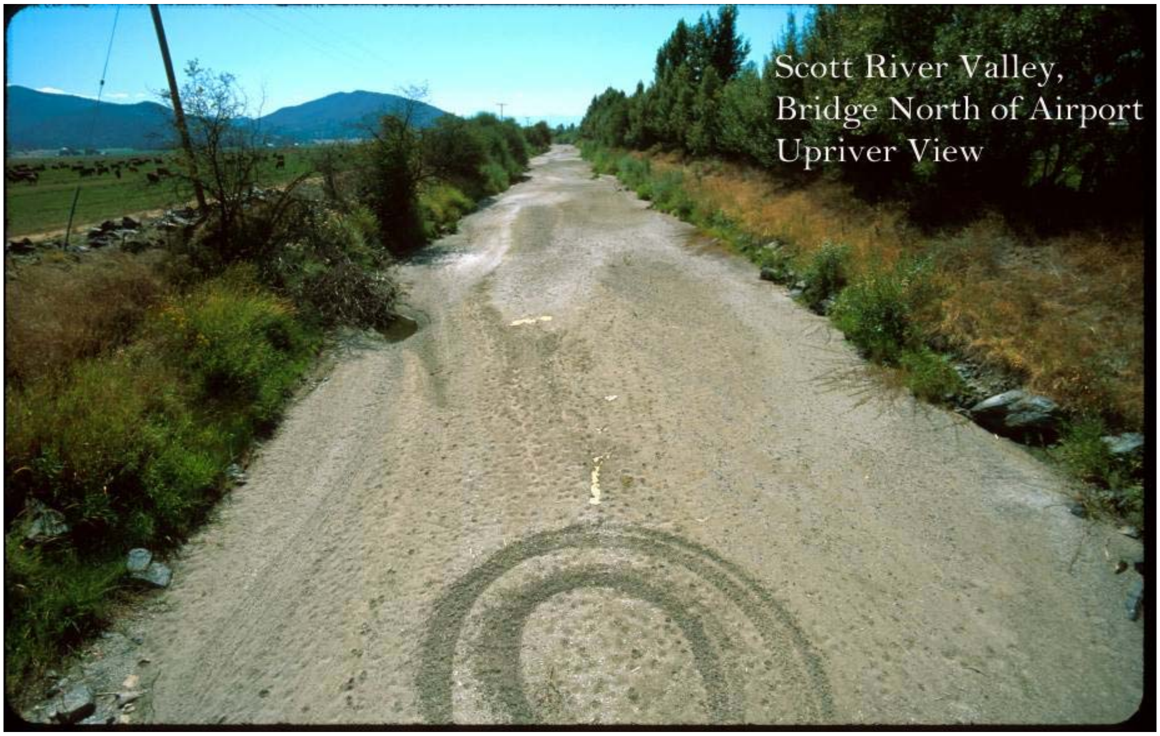


Figure 7. This photo shows the dry bed of the Scott River in a reach near the airport looking upstream. Photo from KRIS taken by Michael Hentz. 2002.

Figure 8. Scott River at Fort Jones Bridge looking downstream. Note streambed is comprised of mostly sand. Photo from KRIS taken by Michael Hentz. 2002.

Many tributaries of the Scott River that are known to harbor steelhead and coho salmon (see Fish section below) are routinely de-watered as a result of water extraction for irrigation. Figure 9 shows Moffett Creek where a combination of surface water extraction and ground water extraction combines to cause a loss of surface flow (Kier Associates, 1999).

Figure 9. Moffett Creek in August 1997 after the January 1997 Storm and subsequent excavation. Note lack of riparian trees due to drop in ground water levels (Kier Associates, 1999). Photo from KRIS Version 3.0.

Other major salmon and steelhead bearing tributaries that now typically lose surface flow due to diversion are Shackleford Creek (Figure 10 and 11), Kidder Creek (Figure 12) and Etna Creek (Figure 13). All stream reaches that are currently de-watered were formerly excellent salmonid rearing areas. The National Academy of Sciences (2003) makes it clear that "dewatering of tributaries eliminates potential rearing habitat for coho and causes loss of connectivity and reduction of base flow in the main stem."

Low Flow Adds to Water Temperature and Water Quality Problems

The National Academy of Sciences (2003) makes a clear case that flow depletion is at the root of temperature problems in the Scott River. As flows drop, transit time for water increases, allowing an opportunity for stream warming. Figure 14 shows maximum daily water temperatures at several mainstem Scott River locations during 1996. The South Fork has the coolest temperatures because it flows from U.S. Forest Service lands and has few diversions. The East Fork is much warmer by comparison and has a substantial number of diversions. The Scott River warms as it flows downstream, with temperatures well over stressful (McCullough, 1999) and sometimes over lethal (Sullivan et al, 2001) levels.

A thermal infrared radar (TIR) image of Shackleford Creek (Figure 15) was taken by Watershed Associates (2003) as part of the Scott River TMDL study process, and shows dramatic effects of flow depletion on water temperature. Shackleford Creek is cool enough for juvenile salmonid

Figure 10. Shackleford Creek looking downstream at a bridge over a middle reach showing complete loss of flow due to diversion. Photo from KRIS V 3.0 taken by Michael Hentz.

Figure 11. This photo shows the dry creek bed of Shackleford Creek at its convergence with the Scott River in August 1997. Photo from KRIS Version 3.0.

Figure 12. Photo shows Kidder Creek looking upstream off the Highway #3 Bridge in Greenview. Photo from KRIS V 3.0 by Michael Hentz. 2002.

Figure 13. Photo shows Etna Creek looking downstream off the Highway 3 Bridge. Photo from KRIS V 3.0 by Michael Hentz. 2002.

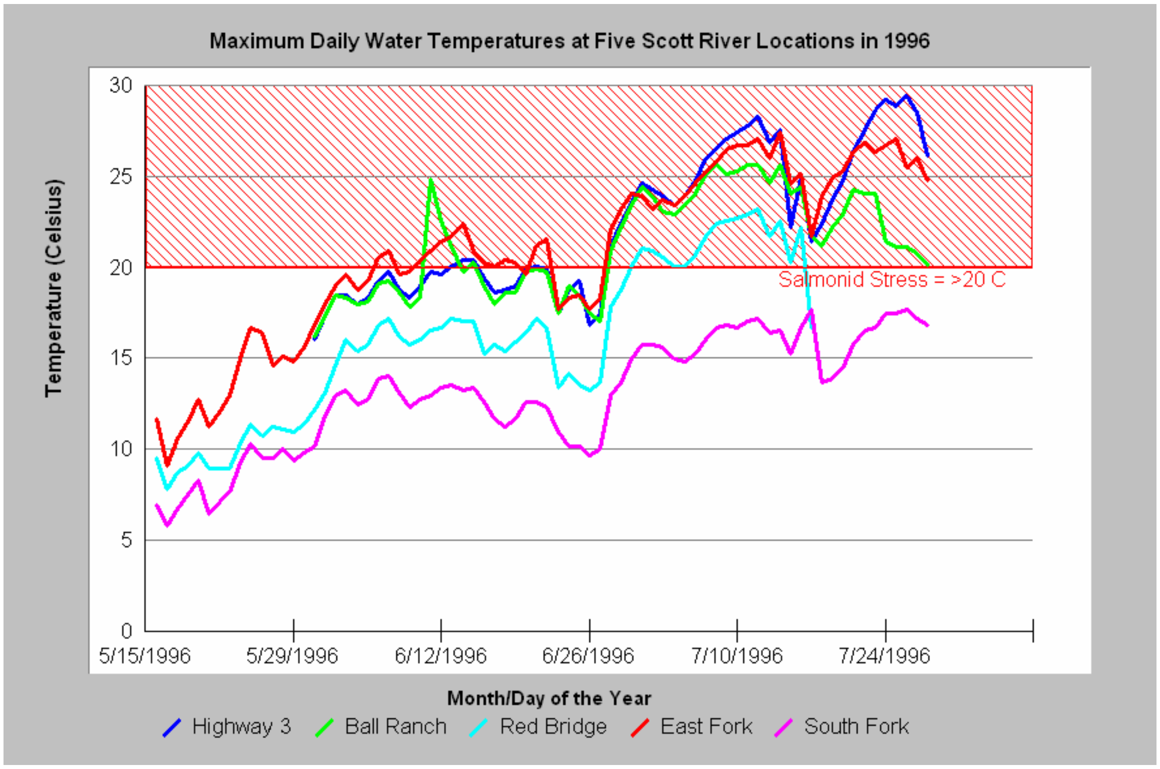


Figure 14. Water temperature at various Scott River mainstem locations in 1996. Chart from KRIS V 3.0 and data from the Siskiyou Resource Conservation District.

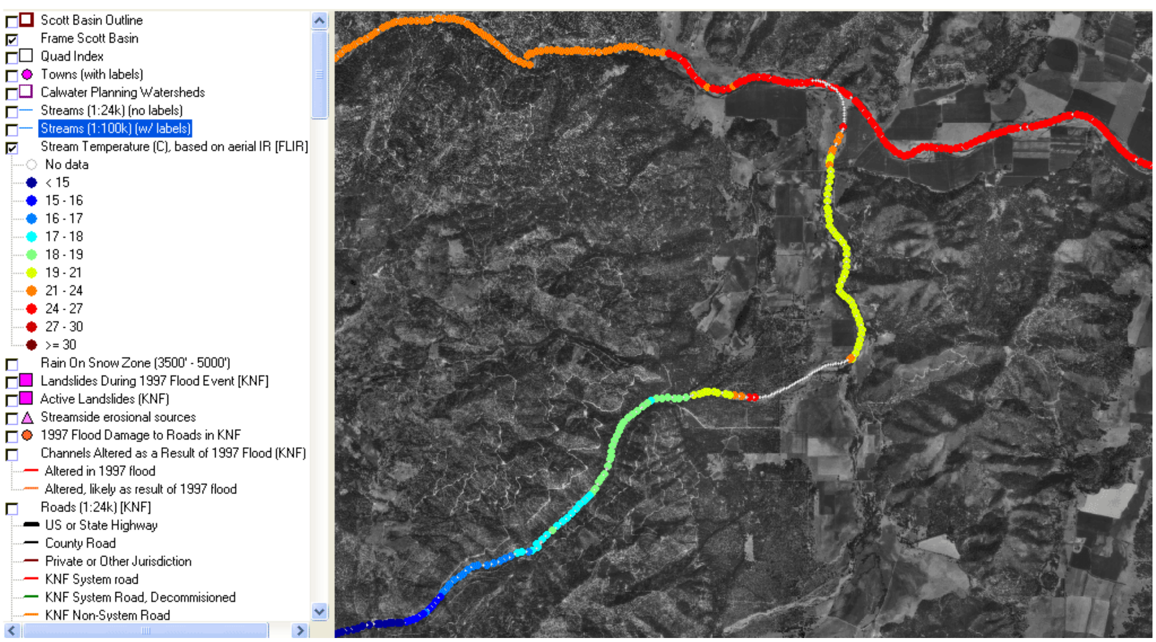


Figure 15. This map shows summary data of Scott River Thermal Infrared Radar (TIR) surveys for Shackleford Creek. Note that water temperature warms in a downstream direction as flow is depleted. Reaches with no temperature coded color (i.e., gray) are dry. Data from Watershed Sciences (2003).

rearing above points of diversion, then warms rapidly as its flow is depleted. Flow resumes below the major tributary Mill Creek, warms again as flow is further reduced by irrigation until surface flows are again entirely lost, just upstream of the convergence with the Scott River.

Although the Scott River is not yet listed as "water quality limited" for nutrients, dissolved oxygen (DO) or pH, these problems may arise if flows drop low enough to cause stagnation. Figure 16 shows a reach of the Scott River with much depleted flows due to irrigation. The algae blooms seen forming here can cause a diurnal increase in pH associated with high rates of photosynthesis and very low nocturnal dissolved oxygen (DO) levels as algae respires.

Figure 16. Photo shows the mainstem Scott River looking downstream with significant signs of algae blooms evident. Algae growth may alter water chemistry. Photo from KRIS V 3.0 by Michael Hentz.

Sediment and Increased Peak Flows Cause Channel Scour and Lead to Stream Warming

Kier Associates (2005) point out that changes in sediment yield and watershed hydrology related to logging and road building in the Scott River basin can also contribute to water temperature problems. The January 1997, flood damage report by the Klamath National Forest (de la Fuente and Elder, 1998) indicated that debris torrents caused 437 miles of stream channel scour, which in turn made these streams more subject to warming. Landslides were most frequently triggered by road failures, but were also well above background occurrence levels in recently logged or burned areas. Water temperature data from the Karuk Tribe and Klamath National Forest show that some tributaries of the lower Scott River increased in water temperature as a result of debris torrents associated with the January 1997 storm (Figure 17). Canyon Creek and Boulder Creek

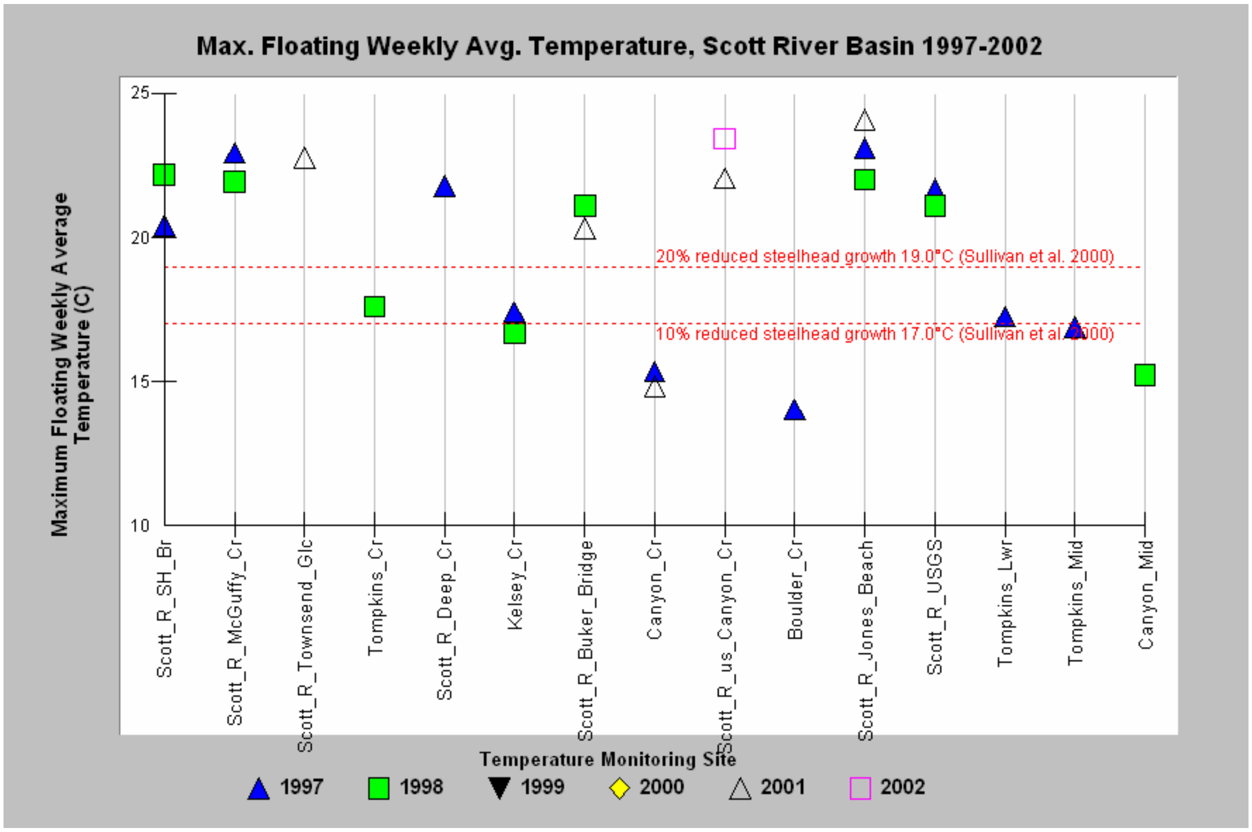


Figure 17. Maximum floating weekly average water temperature (MWAT) for several mainstem Scott River and tributary locations. Data from the Karuk Tribe and USFS.

did not experience debris torrenting and thus still maintain water temperature sufficiently cool to support coho salmon. Welsh et al. (2001) found that coho were present in streams that did not attain a maximum floating weekly average water temperature (MWAT) of greater than 16.8 C. Figure 17 shows reference lines from Sullivan et al. (2001) that indicate suppressed growth in steelhead juveniles at temperatures higher than 17 C.

Kelsey Creek and Tompkins Gulch both had major channel alterations as a result of the January 1997 storm which likewise triggered stream warming. Figure 17 indicates that neither of these streams was sufficiently cool to support coho juveniles after 1997. The Klamath National Forest flood study (de la Fuente and Elder, 1997) noted that the stream damage was high given the fairly low recurrence interval of the storm event, which was judged to be a 14-35 year event. Extensive logging, road building and fires all combine to elevate flood risk (Figure 18) and resulting increased flows and sediment yield caused major channel adjustments (Figure 19).

The lower reach of McGuffy Gulch, a tributary of the lower Scott River, serves as an example of what type of damage debris torrents can cause. Damage to this stream went well beyond loss of channel depth and increased channel width (Figure 20). The channel was buried so deeply that it lost surface flow. Kier Associates (2005) point out that channel scour can also occur due to increased peak flows related to rain-on-snow events (Berris and Harr, 1987; Coffin and Harr, 1991). Jones and Grant (1996) describe how road cuts intercepting ground water pathways can shunt water into road ditches, thus increasing peak flows and cutting off ground water recharge downhill, in turn resulting in decreased summer base flows.

Figure 18. Patch clear cuts, areas burned by forest fires, plantations and road networks in upper Kelsey Creek set the stage for flood damage and 70% channel scour by the January 1, 1997 storm. Photo by Patrick Higgins from KRIS V 3.0.

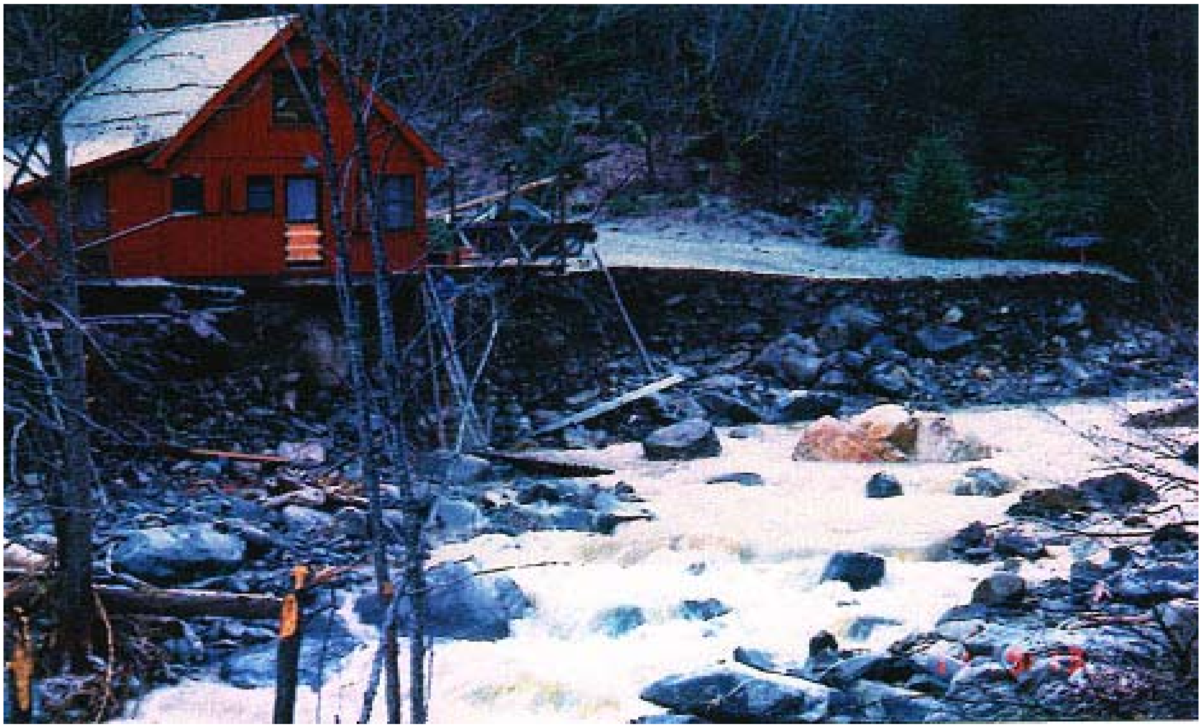


Figure 19. Kelsey Creek, just upstream of its mouth in early 1997, with snapped alder trees, large rubble and bank erosion near the house indicative of recent debris torrent damage. KRIS V 3.0.

Figure 20. Photo shows McGuffy Creek, a lower the Scott River tributary, just upstream of the Scott River Road. From KRIS V 3.0 by Michael Hentz. 2002.

Fish Population Status, Trends and Need for Immediate Action

The low gradient of the mainstem Scott River and its major tributaries made it ideal habitat for summer and winter steelhead, spring and fall chinook and coho salmon. Long term declines in these populations have been well documented (Kier Associates, 1991; CH2Mhill, 1985). Scott River spring chinook and summer steelhead populations are at remnant levels and are only sighted infrequently in surveys.

The low flows coming out of the lower Scott River Valley today not only reduce carrying capacity for juvenile salmonids but would also prevent any successful attempts by summer steelhead or spring chinook adults to hold over during summer. The Scott TMDL needs to recognize also that spring chinook and summer steelhead recovery may be attainable, due to metapopulation function (Rieman et al., 1993), if cold water refugia are restored in the lower Scott River, sediment diminished and water flows improved.

The Scott River TMDL should also specifically target recovery of coho salmon, which are recognized as “threatened” under both the federal and California Endangered Species Acts. The distribution of coho spawning is known (Figure 21), yet the TMDL does not specifically focus protection or restoration on reaches or tributaries that presently harbor ESA-listed coho as “best science” restoration efforts must (Bradbury et al., 1996).

Scott River adult coho returns are now only robust in one out of three year-classes, which is an indicator that the population is trending towards extinction (Rieman et al., 1993; NMFS, 2001; CDFG, 2003). Table 2 shows downstream migrant trapping results from CDFG indicating that coho juveniles are only abundant in one of three years following high spawner years.

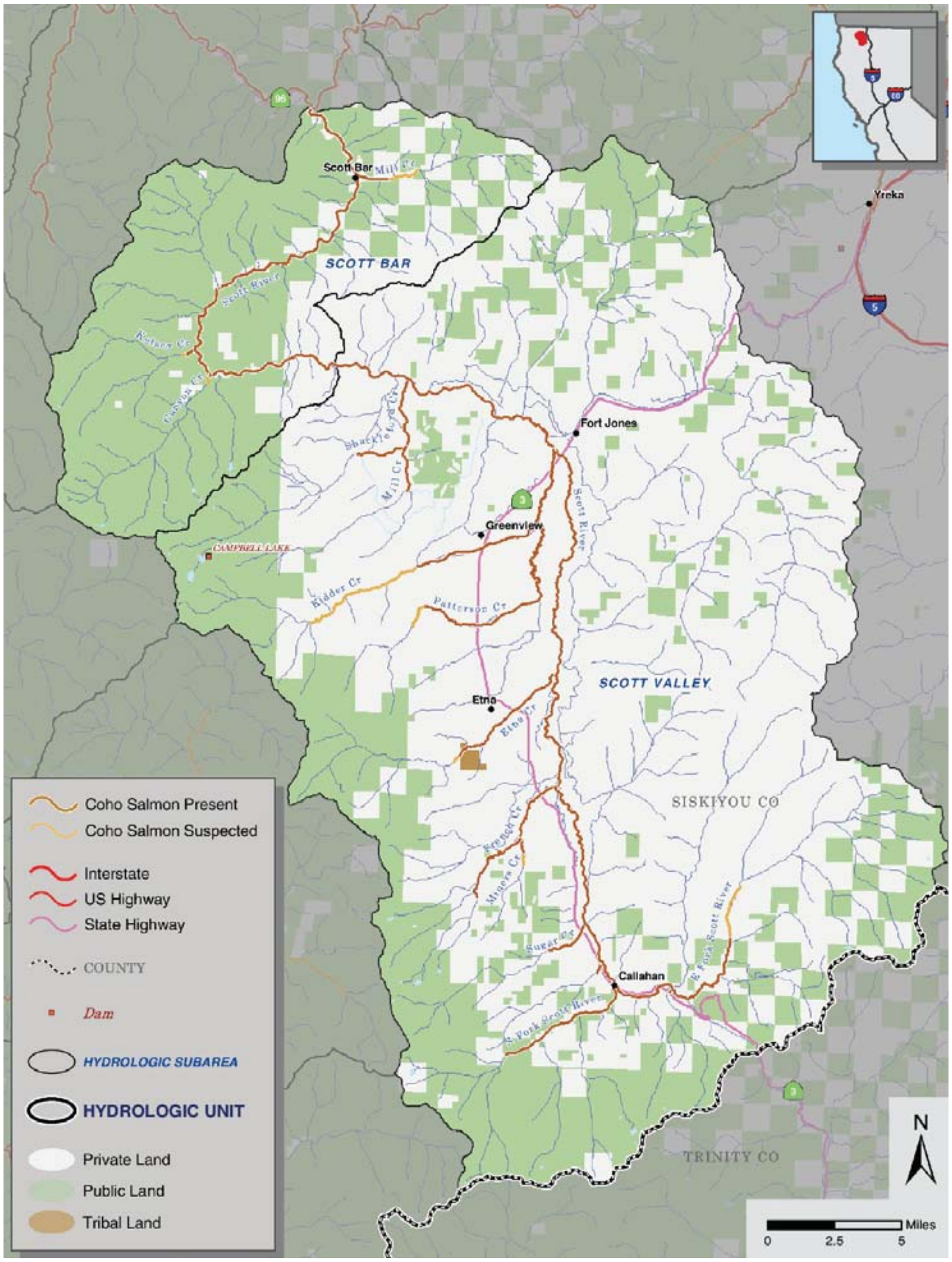


Figure 21. Coho salmon distribution map for known or potential Scott River spawning locations (from Maurer, 2001).

Grand Total by Species:	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	TOTALS
Steelhead	10181	17693	5943	7127	7980	4158	5008	21982	79887	135319	69823	**365101**
Coho	15	433	0	253	3	8	538	30	69	30019	50	**31418**
Chinook	2	266	0	3	1	0	0	365	3191	0	0	**3828**
Totals =>	**10198**	**18392**	**5943**	**7383**	**7984**	**4166**	**5546**	**22377**	**83147**	**165338**	**69873**	**400347**

Table 2. Coho in California Department of Fish and Game trap records as taken from Siskiyou RCD (2004) Table 6c.

Scott River fall chinook returns likewise plummeted in 2004 and 2005 to the lowest level on record for two years in a row (Figure 22). Higgins et al. (1992) discussed the risk of extinction of northwestern California Pacific salmon stocks and discussed minimum viable population sizes, noting that:

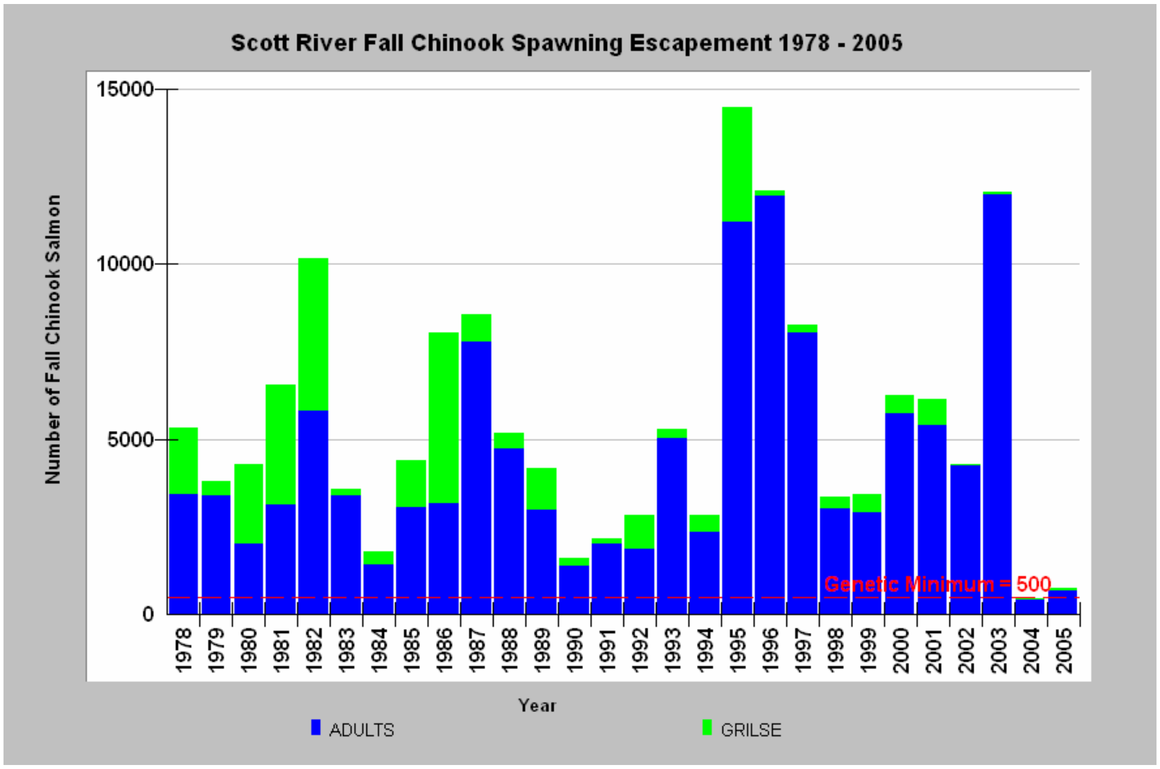


Figure 22. Scott River fall chinook escapement shows both 2004 and 2005 as the lowest years on record. Data from CDFG.

> "When a stock declines to fewer than 500 individuals, it may face a risk of loss of genetic diversity which could hinder its ability to cope with future environmental changes (Nelson and Soule, 1986). A random event such as a drought or variation in sex ratios may lead to extinction if a stock is at an extremely low level (Gilpin and Soule, 1990). The National Marine Fisheries Service (NMFS, 1987) acknowledged that, while 200 adults might be sufficient to maintain genetic diversity in a hatchery population, the actual number of Sacramento River winter run chinook needed to maintain genetic diversity in the wild would be 400 - 1,100."

In other words, despite favorable or average ocean conditions (Collison et al. 2003) and wet years with at least average flows, the population of fall chinook in the Scott River has fallen to critically low levels. These populations have some additional ability to rebound without loss of genetic diversity because chinook spawn at different ages (Simon et al. 1986), but the low adult returns should be viewed with considerable alarm. Low flow, water temperature problems and high sediment yield are all playing a role, although mainstem Klamath River water quality problems are also a factor in the decline of Scott River fall chinook (Kier Associates, 2006).

Discussions above show that flows in the lower Scott River in October do not even meet requirements of the *Scott River Adjudication* in October, when fall chinook salmon adults would be migrating upstream and spawning. Very low flows in the Scott River canyon cause a concentration of spawning by fall chinook in the lowest reaches (Figure 23). This concentration poses higher risk for egg survival than if flows were sufficient for chinook spawners to disburse upstream (Kier Associates, 2005). Epidemic transmission of disease also becomes a higher risk under such densities. Risk of increased peak flows that might mobilize the stream bed is also higher in the lower mainstem than in upstream reaches or tributaries. Large quantities of decomposed granitic sand in transport through the Scott River canyon may also be mobilized by high flows and smother eggs or entomb alevin.

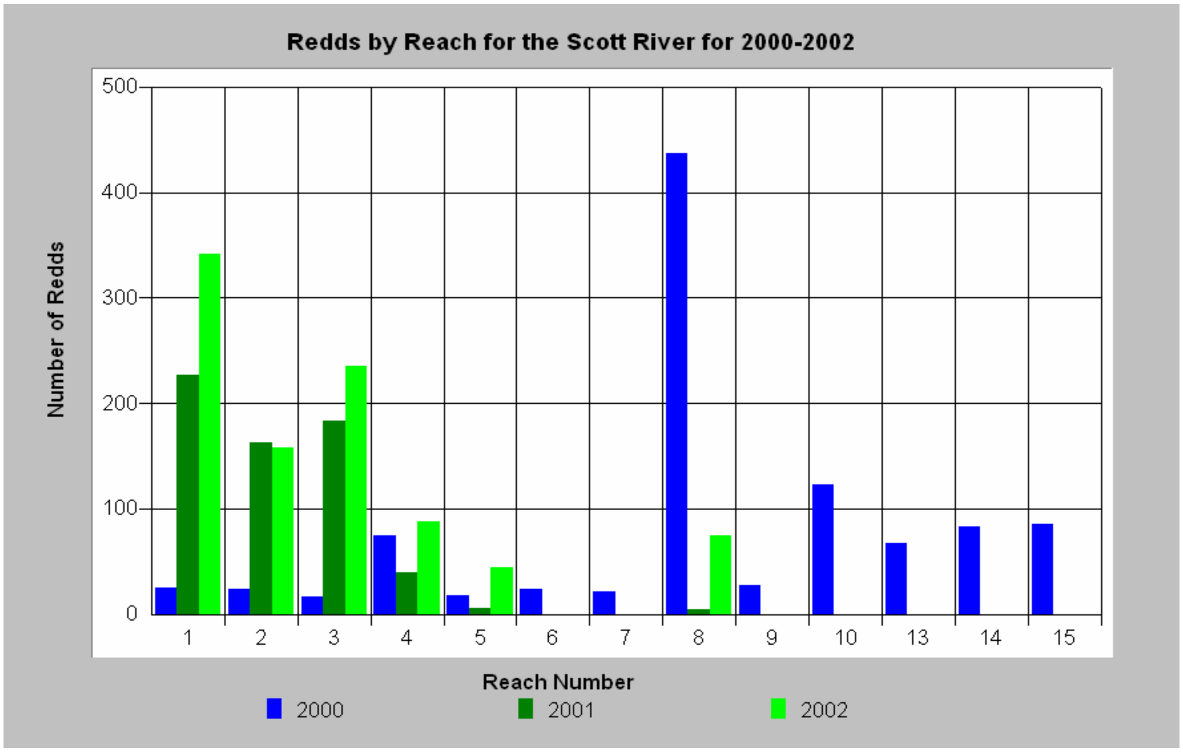


Figure 23. Data from CDFG spawner surveys show that fall chinook salmon spawned mostly in the lowest five reaches of the Scott River in 2001 and 2002, where eggs may be vulnerable due to potential for bed load movement or transport of decomposed granitic sands.

Collison et al. (2003) noted that we are presently experiencing relatively favorable conditions for salmonids in the ocean and in a wet on-land cycle that will likely reverse sometime between 2015 and 2025 in what is known as the Pacific Decadal Oscillation (PDO) cycle (Hare et al. 1999). That coho salmon and fall chinook salmon populations are at such low levels or showing declines during the positive cycle of the PDO is not a good sign. In order to restore Scott River chinook and coho salmon stocks, flow and water quality problems must be remedied by 2015 or whenever the PDO switches to less favorable conditions for salmon stocks or further extinctions are likely to occur.

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COMMENT 5 (via email)

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Thank you for the opportunity to comment on the Scott Valley Community Groundwater Study Plan.

Overall, this study plan looks good and should provide some valuable insight as to how future water management decisions will be made in the Scott River.

We continue to look forward to working with the Scott River Watershed Council and others, to conserve, protect and enhance fish and wildlife resources for the public's benefit.

General Comment

A precipitation runoff model (to simulate streamflow conditions) in addition to the groundwater model may better explain precipitation/groundwater interactions.

Management alternatives may then be simulated and compared to existing conditions.

Alternatives include;
1. Current flow, existing conditions.
2. Line or pipe irrigation canals to limit seepage losses.
3. Increase surface water diversions through unlined canals for aquifer recharge.
4. Convert from surface-water to ground-water resources to supply water for irrigation.
5. Reduce or increase tree density or vegetation types in a particular reach.
6. Natural flow.

Will additional seepage measurements at point of diversion/return be needed in addition to measuring streambed seepage?

Do we know or have we mapped all the gaining and losing reaches within the basin? If not, this would be valuable information to obtain through this work. Basin wide consideration of streamflow gains and losses provide a broader context for the influence of irrigation canal seepage. These areas may also help prioritize habitat restoration projects, especially off-channel/floodplain restoration.

To what extent do irrigation diversions reduce low-flow discharge in the basin?

What fraction of groundwater re-charge is due to irrigation canal seepage?
How would increased groundwater pumping (rather then surface water diversions) influence low-flow discharge?

COMMENT 6

California Regional Water Quality Control Board
North Coast Region
John W. Corbett, Chairman

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Linda S. Adams
Secretary for Environmental Protection

Arnold Schwarzenegger
Governor

November 21, 2007

Thomas Harter, Ph. D.
Ryan Hines
125 Veihmeyer Hall
University of California
Davis, CA 95616-8628

Dear Dr. Harter and Mr. Hines,

Subject: Comments on Draft Scott Valley Community Groundwater Study Plan

File: Klamath Watershed, Scott River TMDL Implementation

Staff of the California Water Quality Control Board, North Coast Region (Regional Water Board) have reviewed the Penultimate Draft Scott Valley Community Groundwater Study Plan, dated October 9, 2007, and are pleased to have the opportunity to offer the comments below.

We commend you for compiling a large amount of background information relevant to the study, and identifying a comprehensive suite of analytical techniques and approaches useful for addressing the study of the interaction of groundwater and surface waters in the Scott Valley. We also recognize the efforts of Jim DePree of Siskiyou County, Danielle Quigley and Erich Yokel of the Siskiyou Resource Conservation District (SRCD), and Sari Sommarstrom of the Scott River Watershed Council (SRWC).

Chapter 2: Goals and Objectives

Please replace "RWB" on line 212 and again on line 216 with "RWB staff".

Regional Water Board staff would like to amend our previously stated expectation that begins on line 223. Please add the following language to the end of the sentence on line 224: "...and water quality, particularly stream temperature."

Chapter 3: Background: Current Scott Valley Conditions

While there is an impressive amount of relevant information presented in this chapter, the description of current Scott Valley conditions is lacking available information describing changes in surface flow trends, as measured at the USGS' "Scott River near Fort Jones" gauge. The surface flow trends are particularly relevant to groundwater conditions in Scott Valley because nearly all of the water passing the gauge in the late summer originates as groundwater in Scott Valley. Regional Water Board staff believe that investigating and presenting trends in annual low flow data (or some other measure of low flows), and comparing the timing of the low flow trends with changes in water management will be helpful in improving the understanding of the interaction of groundwater and surface water in Scott Valley.

Similarly, spatially distributed flows measured in 1972, 1973 (SWRCB, 1974), 2003 (presented in the TMDL), 2006, and 2007 (measured by SRCD) should be presented. These data show how flows increase from upstream to downstream through Scott Valley. These data, in combination with the infrared temperature surveys of 2003 and 2006, are very useful for defining the location and typical magnitudes of groundwater discharges to the Scott River. In fact, these data may satisfy most or all of the data requirements for Element 3 of Phase I, as described on lines 2839 and 2840 of the plan. Additionally, Regional Water Board staff believe these data are also useful for understanding the changes in low flow trends that have occurred since the early 1970s. Regional Water Board staff will provide these data at a later date.

Chapter 6: Road Map and Cost Estimates

Regional Water Board staff believe the information contained in this chapter is the aspect of the study plan that stands to benefit the most from further refinement. While we acknowledge the difficulty in developing a "road map" and associated cost estimates so early in an effort such as this, Regional Water Board staff believe it is important that more detailed information be developed to help the County and its stakeholders move forward effectively and intelligently in the face of scarce funding opportunities.

The Study Plan will benefit from a more transparent linkage between the research elements in Chapter 5 with the actions identified in Chapter 6. A description of the specific research elements required to complete each of the actions described in Chapter 6 would allow for easier refinements in the approach and cost estimates in the future. Likewise, where multiple research elements overlap or are redundant, the priorities of or preferences for the elements should be identified. For instance, both the fiber optic and thermal infrared temperature data collection methods give high resolution longitudinal temperature profiles, but differ in other ways. Which of the tasks are these techniques needed for, and are they both needed? Similarly, if installation of piezometers every square mile is not possible or has to occur in stages, how should a reduced well network be distributed? Is it more critical to distribute the piezometers near the river, or evenly throughout the valley? Incorporation of the answers to these types of questions will allow for more informed revisions in the future, and the best use of limited resources.

The assumptions used to develop the cost estimates provided in Chapter 6 should be described. This is important because these estimates will be used to pursue funding. More details describing costs will facilitate the development of funding requests by the County and its stakeholders, and will ultimately make for a more competitive funding request. Also, as the costs of specific research elements of the plan change in the future, the larger cost estimates can be more easily and accurately modified.

Finally, Regional Water Board staff are concerned that this study plan may give the impression that conclusions from the study will not be available until the completion of all phases of the plan are complete, possibly up to 20 years from initiation of the study. We believe that many significant conclusions can be established prior to completion of all phases of the study. Furthermore, Regional Water Board staff believe that we are in agreement with you on this subject, based on Dr. Harter's previous public statements. However, this idea is not described or acknowledged anywhere in the study plan. Regardless, Regional Water Board staff expect the study that comes out of this plan will result in some conclusive understandings and on-the-ground actions within a few years.

In conclusion, Regional Water Board staff thank you for the opportunity to comment on the Draft Scott Valley Community Groundwater Study Plan, and look forward to working with you on the plan and study in the future.

Sincerely,

Bryan McFadin
Water Resource Control Engineer
Scott River TMDL Coordinator

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Cc: Jim Depree, County of Siskiyou, PO Box 1085, Yreka, CA 96097

Carolyn Pimentel, Siskiyou RCD, PO Box 268, Etna, CA 96027

Bill Krum, Scott Valley resident, October 15:

Dr. Harter

Enclosed are my comments on the Penultimate Draft of the Scott Valley Community Groundwater Study Plan. I am utilizing the line number designation in the draft for ease of reference.

74. syntax

694. Suggest adding Shackleford Creek to this list

705. The northern portion of Scott Valley is bordered on the west by the Marble Mountains while the southern portion of the valley is bordered on the west by the Salmon Mountains. Suggest replacing “Marble Mountains” with “Marble and Salmon Mountains.”

751. I think this would more correctly reflect the concerns of the landowners in Scott Valley if after “…healthy ecological system” you inserted “while maintaining the viability of the local agricultural based economy”

812. The proper name for the RCD is Siskiyou RCD, not Siskiyou County RCD. This error is replicated throughout the document.

960. Verb usage/syntax

1361. Probably true as stated but misleading. Most of the stock water in Scott Valley utilizes existing irrigation ditches. The amount of water required to generate sufficient “head” and compensate for ditch loss far exceeds the actual consumption by livestock. As an example, on my ranch we have about 75 cattle and horses that get their winter water from my irrigation ditches, the water coming from French Creek. In order to get the water through the ditch to my ranch, and then distribute it throughout the ranch where the livestock are, as well as have enough flow to operate the self-cleaning brushes on the fish screen requires nearly 0.5 cfs or 1 acre-foot per day. Given this system is currently used for six months from the cessation of irrigation on Oct 1 until it begins again the following April 1, I alone divert 180 acre ft for this purpose.

Obviously this water is not lost to the watershed; most of it likely ends up back in the stream. Nonetheless, we believe there is a significant impact on fall stream flows that can be addressed by installing alternative stock watering systems domestic wells, pipes and watering troughs.

I would suggest adding a sentence to the end of this section saying something like, “Due to the fact that water for stock during the fall and winter is often delivered through open irrigation ditches, substantially more water than that actually consumed by the livestock is diverted into ditches during fall and winter.”

1377. Should “31 percent” be “30 percent”?

1540. The State Water Code was changed 4 or 5 years ago and no longer provides for watermaster costs being paid one-half by the State of California. It is now wholly the responsibility of the landowners per the State Water Code. For the last several years the Legislature has stepped in and picked up the increased cost. This is not going to go on forever which is the reason the Shasta and Scott Valleys are moving to form a special district to handle watermastering. I would suggest you just remove the sentence dealing with the 50 – 50 split of costs.

2133. syntax

2290-2293. It should be noted that data does exist for Shackleford-Mill and French-Miners Creeks as they are watermastered. Wildcat, Sniktaw and Oro Fino Creeks are also watermastered but the bulk of the water rights in the Scott River Decree are not.

The material in ( ) is not strictly correct. A correct statement for the bulk of water rights holders under the Scott River Decree would be “For diverters who participate in the Watershed-Wide Permitting Program being developed by DFG and the Siskiyou RCD their diversion rates will have to be verified by a watermaster or other means acceptable to DFG.”

2380. Should “the” be “that”?

2391. Should “was using” be “uses”?

2427. I have never seen “landuse” as a single word. Suggest “land use.”

2431 “totaling”?

2449. “may obtained” needs to be changed.

2510 -2516 Marcia Armstrong already made this point. Language needs to be added that all this has to take place while maintaining the local agricultural based economy and community.

2538. What is “physically defensive”?

2582. landuse

2616. “demandsui.”

2632 and 2643. It is not clear if InHM is a specific model or something else.

2726 – 2728. Sentence fragment

2748. Should read “Siskiyou RCD”. Also suggest deleting “Scott Valley” immediately preceding “Scott River Watershed Council” as it is redundant.

2784 – 2786. syntax

2799. Is “publics” correct?

2817 – 2819. Incomplete thought.

2862 – 2869. Numbering system has gotten mixed up with the points being made.

3299 – 3315. Written in the first person.

3370 – 3372. The language about augmentation of stream flow with ground water is incorrect. This language was in an early draft of the ITP but was eliminated in later drafts. A correct statement would be that the ITP requires “the development of a Dry and Critically Dry Year Contingency Plan.”

Marc Horney, NRCS, Yreka, October 15:

Erich & Thomas:

Attached are a few comments I made on Section 7 - further research questions. This follows some conversations regarding how to explain "Lagrangian components" to a general audience (which I am ill-equipped to do). Unfortunately I didn't care any more for most of these research topics than I did for the "hypotheses" in the early section. Were I an actual hydrologist or geologist, I might have been able to make more substantive and constructive comments. A pity that Bill's illness has taken him out of the loop this summer. I can't begin to fill his shoes in this regard. Moreover, I'm starting to worry that I'm just turning into a crank... :)

Best regards,

Marc R. Horney, Ph.D., CRM
Rangeland Management Specialist
Klamath Basin Watershed Team
USDA-NRCS
215 Executive Court, Suite A
Yreka, CA 96097
(530) 842-6123 x136
(530) 842-4990 fax
marc.horney@ca.usda.go

Lisa Thompson, UC Davis, October 19:

Hi Thomas,

That's a very thorough proposal you've put together!

I read over the sections you mentioned and they look good to me. I've made some minor suggestions.

Section 3.2.1. No changes.

Section 3.2.2.
I found a typo on page 19, line 794. I think it should read: At the southern end of the mainstem Scott...

Section 3.3.
Please see Word file, attached.

Good luck with the study!

Lisa

Aaron Packman, Northwestern University, Chicago, November 11:

Thomas,

Some quick thoughts:

-Modflow will give you the larger-scale components, but not the ones induced by the stream flow. My student Susa Stone is working on developing a 3D model that superimposes another flow solution on modflow to try to capture these effects. It's rough, but the best that we can do now for multi-scale modeling. That is, without trying to build a detailed 3D CFD-type model of the study reach to add to modflow. So this is what I was thinking about anyway, and maybe it would make sense to try to add that component.

-If Greg doesn't want to do the geomorphology work, then I suggest you contact Gordon Grant at the USDA Forest Service Lab in Corvallis -- and he also has an appointment at OSU, so this work he would probably do with students from there. Another possibility is John Buffington, who is at the Forest Service in Idaho and has a similar relationship with U. Idaho. Both of them have done geomorphology related to hyporheic exchange for fish spawning habitat.

[….]

--Aaron

Aaron Packman, Northwestern, November 4:

Thomas,

Sorry for the late reply -- have been super busy, and was sick for about 10 days too. Now actually have time to write since I'm on a plane to a workshop. I did put through the USDA subcontract budget, so that should be all done now.

The document you sent is pretty interesting. Obviously it will be a HUGE piece of work, but indeed it will be necessary to develop this type of information in order to support scientifically justifiable long-term decision-making (i.e., sustainable water management). The approach generally looks good to me, and I think you've identified the most important surface-groundwater interactions questions. I'm impressed that you identified and compiled so much background information on the site. That will help a lot, but it will still be a huge effort to turn all of that into practical decision-making tools. In many ways we still lack the necessary conceptual and theoretical underpinnings to address these questions, but we can only develop that through projects like this one.

Not too many people have really taken this on before. If you have not done so already, I suggest you check with Scott Larned at NIWA-Christchurch to learn about what they've been doing in the Selwyn River. The hydrogeology and geomorphology are somewhat similar to what you're dealing with, though the Selwyn is larger and more directly connects the mountains (Southern Alps) to the ocean. The Selwyn cuts right across the Canterbury Plain, and there are huge water diversions for agriculture -- mainly for sheep farming, and now for a ton of dairies as well. So they have been trying to develop this type of information for some time (though not for temperature, really just for stream flow and water quality).

Also, if he is not already involved, Greg Pasternack should really be able to help with the sediment issues.

What type of groundwater/surface-water interaction model are you thinking about developing? We have been developing a first-order type approach that could be used for this (the spectral scaling model with Anders Worman). It would be rough, but could be used as a good scaling and preliminary decision-making tool. The student working on this here (applying the model to river reaches) will be graduating in the spring and could maybe, just possibly, be a good person for you to get involved with this if it goes forward.

Please let me know how it goes! Do you know what the timing will be on these efforts??

--Aaron

COMMENT 7 - Attachment to Thompson's

3.3 Biological Setting

The Scott River historically supported a robust aquatic ecosystem, including anadromous salmonids. Three salmonid species are currently present in the Scott River: Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), and rainbow (steelhead) trout (*O. mykiss*). Chinook salmon are the basis of important commercial, sport, and tribal fisheries in Northern California and the Klamath River. Coho salmon in this area are listed as "threatened" under the California and Federal Endangered Species Act. These anadromous fish require suitable habitats on a watershed scale as they move from freshwater to estuarine and marine ecosystems and back in order to successfully complete their life cycle.

Impaired water quality and quantity in freshwater streams is believed to be one of the largest "bottlenecks" to the production of salmonid "smolts" entering the ocean and can impede adult salmonids from accessing suitable spawning areas. In addition to water quality and quantity parameters, it is hypothesized that in-stream habitat degradation and historic watershed alteration (upslope and in-channel) produce cumulative effects on freshwater survival from the egg stage to the smolt stage.

Figure 3-4: Salmon life cycle

The three different salmonids utilizing the Scott River follow the salmon life cycle depicted in Figure 3-4 with the different species having characteristic timing and lengths for the various stages. The exception is some rainbow trout that can complete the life cycle without a period of ocean residency. This discussion will focus on the Chinook and coho salmon due to their economic, cultural, and regulatory significance combined with their more "rigid" life cycle patterns and habitat preferences.

Adult Chinook salmon enter the Scott River in early October through November and largely spawn in suitable habitats of the main stem Scott River. Adult Chinook will

spawn in both the canyon and valley of the Scott River if the flow regime allows for fish passage through a series of barriers that include disconnected stream reaches in critically dry years. A major priority is to enable the adult Chinook to access as much suitable habitat as possible with emphasis placed on providing fish passage to the low gradient spawning areas of the Scott Valley above Etna Creek.

After successful spawning, the Chinook eggs incubate in the inter-gravel environment of the "redd" until fry emergence - starting in early March in the Scott River (Chesney and Yokel, 2003). During the fry and juvenile stages Chinook rear in the Scott River for several months and then outmigrate via the Klamath River for a period of ocean

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residence that can last from two to five years (three years is average). Outmigrant trapping efforts in the Scott River have shown that the majority (to all) juvenile Chinook emigrate from the Scott River before the flow regime reaches low (base) flow. For this reason, it is believed that groundwater's effect on instream flow (which would be greatest during the period of base flow) is not playing an essential role to the survival of juvenile Chinook.

The significant differences between the Chinook and coho life cycles are in the duration and timing of the life stages. Potentially the most significant difference lies is that juvenile coho typically rear for an entire year in freshwater habitat. This requires juvenile coho to survive the summer low flow period when habitat quantity and quality (especially temperature) can be limiting. During this period of summer rearing, groundwater effects on the Scott River can be locally significant (in some water years) in providing suitable rearing habitats for this cold water fishery.

Adult coho return to the Scott River as three year old fish in November and December and spawn mainly in the lower alluvial reaches of the large tributaries of the "west side" of the Scott Valley. Fry emergence occurs in early April through May – timing is affected by the different winter stream temperature regimes of the different tributaries. Fry and juvenile coho favor low velocity habitats with good cover and a suitable temperature regime.

The majority of documented juvenile rearing of coho in the Scott Watershed occurs in the natal tributaries in which water temperatures are suitable for most (all) of the low flow summer period. Monitoring efforts recording the "ambient" stream temperatures of the East Fork Scott River and mainstem Scott River have shown that during average to low water years there are periods in which the stream temperatures are stressful to lethal for juvenile coho (reference?). Direct observation surveys have shown that these reaches contain limited juvenile coho salmon utilizing areas with cold water input[This sentence is a bit unclear. Were coho observed crowded into area with cold water inflow, such as springs? And if so, were there coho that died because they were not able to access areas with cold water?]. Efforts to understand the distribution, nature, and biological utilization of the cold water inputs throughout the Scott Watershed are an ongoing effort.

These areas offering the rearing fishery "thermal refugia" are the most salient features showing a potential link between groundwater accretion and increased carrying capacity due to the amelioration of an impaired temperature regime. In dry water years (e.g., 2001 and 2007), portions of the main stem Scott River become disconnected, and the alluvial

portions of many tributaries become disconnected in most water years. These disconnected reaches negate juvenile rearing potential and can impede adult salmon migration if they persist into late fall and winter. An understanding of how the ground water and channel morphology are "interacting" might help us understand the processes that define losing and gaining reaches of the Scott River and tributaries.

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Comment [LT1]: In more northern areas they may spend 2 years in freshwater and1 year in the ocean

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Finally, stream temperature data has shown that the Shackleford – Mill watershed has warmer water temperatures in winter and cooler water temperatures in summer in the alluvial reaches of Quartz Valley, when compared to other significant tributaries of the Scott (e.g. the French – Miners). It is hypothesized that this watershed has a greater groundwater influence on the year round flow regime than other west side tributaries. This greater groundwater influence would moderate the stream temperatures year round. The more moderate temperature regime possibly benefits salmonids at all life stages allowing for earlier emergence and greater growth throughout the year creating emigrating fish with superior condition.

Scott River - timing of salmon life stages
Chinook salmon
month
lifestage October November December January February March April May June July August September
spawning
incubation
juvenile rearing
coho salmon
month
lifestage October November December January February March April May June July August September
spawning
incubation
juvenile rearing
steelhead trout
month
lifestage October November December January February March April May June July August September
adult rearing (1)
spawning
incubation
juvenile rearing

(1) - period of freshwater rearing for "summer" ecotype of adult Steelhead trout in Scott River. Timing of spawning for this ecotype is largely unknown.

Table 3-2: Scott River Salmonid Life Cycle Timing

Steelhead (rainbow) trout have a more robust and varied suite of life cycle options available for successful survival and spawning in comparison to the previously discussed salmon species. Steelhead and rainbow trout are two names for the same species of fish - a steelhead trout is an individual of the species that displays the anadromous form of the life cycle, that is, it has migrated to the ocean. The majority of steelhead (winter ecotype) migrate as sexually mature fish during the winter months and spawn from January through March or April in the Scott River. Additionally, the summer ecotype of steelhead migrates into fresh water

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as sexually immature adults in early summer. These adult "summer" steelhead must find suitable freshwater habitat in which to spend the summer until they spawn in the late fall and winter months.

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Insufficient water quantity and inadequate water quality (e.g. temperature) could impede the migration and/or survival of this important ecotype of steelhead trout.

Juvenile rainbow trout rear in fresh water during all seasons of the year. Juvenile rainbow trout (especially 'young-of-the-year' trout) are not as sensitive to water temperatures and habitat requirements as juvenile coho salmon, yet they require suitable cold water

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habitats in the tributaries and mainstem of the Scott River for successful rearing. Larger juvenile rainbow trout (yearling, two year olds, etc.) require deeper waters and prefer the presence of fish cover elements. Habitat degradation coupled with increased water temperature regimes could limit the availability of habitat in the mainstem Scott River and East Fork Scott River during summer rearing. Additionally, limiting the suitable habitat for salmonids to a "small" volume in reaches of the Scott watershed could limit the condition and/or survival of all species by limiting the availability of "partitioned" habitats and creating inter-specific competition and predation.

3.3.1 Adult spawning of Chinook and coho salmon in Scott River

Adult Chinook salmon have been found to predominantly spawn in two reaches of the Valley portion of the mainstem Scott River – above and downstream of the mouth of Shackleford Creek and an approximately 8 mile reach from Fay Lane to below the mouth of Etna Creek. Historic Chinook spawning ground surveys documented a significant utilization of lower Shackleford Creek by adults, but the aggraded mouth of Shackleford currently negates connectivity and access to adult fish during most water years. The reach of the Scott River from below Etna Creek to Meamber Bridge is characterized by low to very low occurrences of Chinook spawning. This is largely due to the lack of suitable sized and sorted spawning gravels and a high occurrence of sand and smaller gravels (reference for the info in this paragraph?).

Adult Chinook surveys have not been performed upstream of the tailing pile below Callahan. It is hypothesized that some spawning could occur in the East Fork Scott River if the disconnected reach in the tailing pile becomes connected and allows adult passage.

Adult coho spawning occurs predominantly in the tributaries of the Scott River. Limited spawning of coho salmon in the main stem Scott River (around the mouth of Shackleford Creek and in the tailings) has been observed in the early period of the coho spawning season when access to the tributaries is prohibited or limited. It is not known if this main stem spawning is volitional or an adaptation to the inability to access preferred habitat.

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COMMENT 7 - Attachment to Horney's comments

7. Further Research Questions

- How did the Scott River originally maintain its temperature? While a higher riparian vegetation density would intercept groundwater flow, higher water levels on the valley floor may and no groundwater pumping may have been sufficient to offset riparian water use.
- Can a model reconstruct prehistoric stream temperatures in the Scott River during the summer and early fall months? Is there geologic evidence that can be used to reconstruct prehistoric stream temperatures?
- Prehistorically, were Scott River flows always sufficient to sustain salmon fishery or only in some years?
- Can modifications to the streambed force sufficient hyporheic exchange to lower the temperature without increasing water levels in the surrounding floodplain?
- What role may the dredge tailings play in lowering the stream temperature?
- Is there a Lagrangian component to diurnal stream temperature variations or other geochemical parameters of interest?
- What were pre-development groundwater flow patterns?
- The infrared thermal survey raised several questions:
  - Downstream of Meamber Bridge, stream temperatures drop by 4 centigrade. Is the drop in temperature because groundwater from Scott Valley is forced to the stream or because groundwater from Quartz Valley is forced to the stream?
  - Why is there a downstream temperature drop at Scott River & Kidder Creek despite the warmer temperatures of Kidder Creek?
  - Another temperature drop is observed downstream from SVID diversion for about 1-2 miles, despite much lower flow volume. Do canal recharge and irrigation force groundwater flow to stream, thereby cooling stream temps?
- What is the usable aquifer storage under various minimum flow requirements in the Scott River?

Comment [m1]: Who is it that actually knows what the Scott River's temperature "was"? We're talking about a dynamic system which has probably gained and lost a number of components over the decades/centuries/millennia, and so has its temperature regime, to some degree. It would be fun to try and model, but it seems to me that would largely be an academic and unverifiable exercise.

Comment [m2]: Are you kidding? I'd be fascinated by any serious attempt to accomplish this, but how would you verify the results? As it is, we can scarcely model the current system with the data we have available.

Comment [m3]: Ibid.

Comment [m4]: Is there a particular region of the river in mind, here? The streambed is sufficiently below the elevation of the surrounding floodplain throughout much of the drainage that I wouldn't think this likely in most cases.

Comment [m5]: For benefit of the laymen out there (including me), could this be restated in plainer terms, maybe something like, "Do daily changes in stream temperature or geochemical constituents follow simple, repeatable patterns, or are their variations more complex, responding to constraints imposed by external features of the local environment?"

Comment [m6]: An interesting question, but, if it is answerable at all, it may be easier to do after we have first established what the present groundwater flow patterns are.

Comment [m7]: Or maybe there are other contributing factors…

Comment [m8]: Or maybe there are other contributing factors…

Comment [m9]: This one might be the most easily addressed of this group. Wouldn't this be roughly the thickness of the aquifer (and specific yield) which lies between the "top" of the aquifer strata and the top of the Scott River, at whatever flow level was considered minimum during critical period(s)?