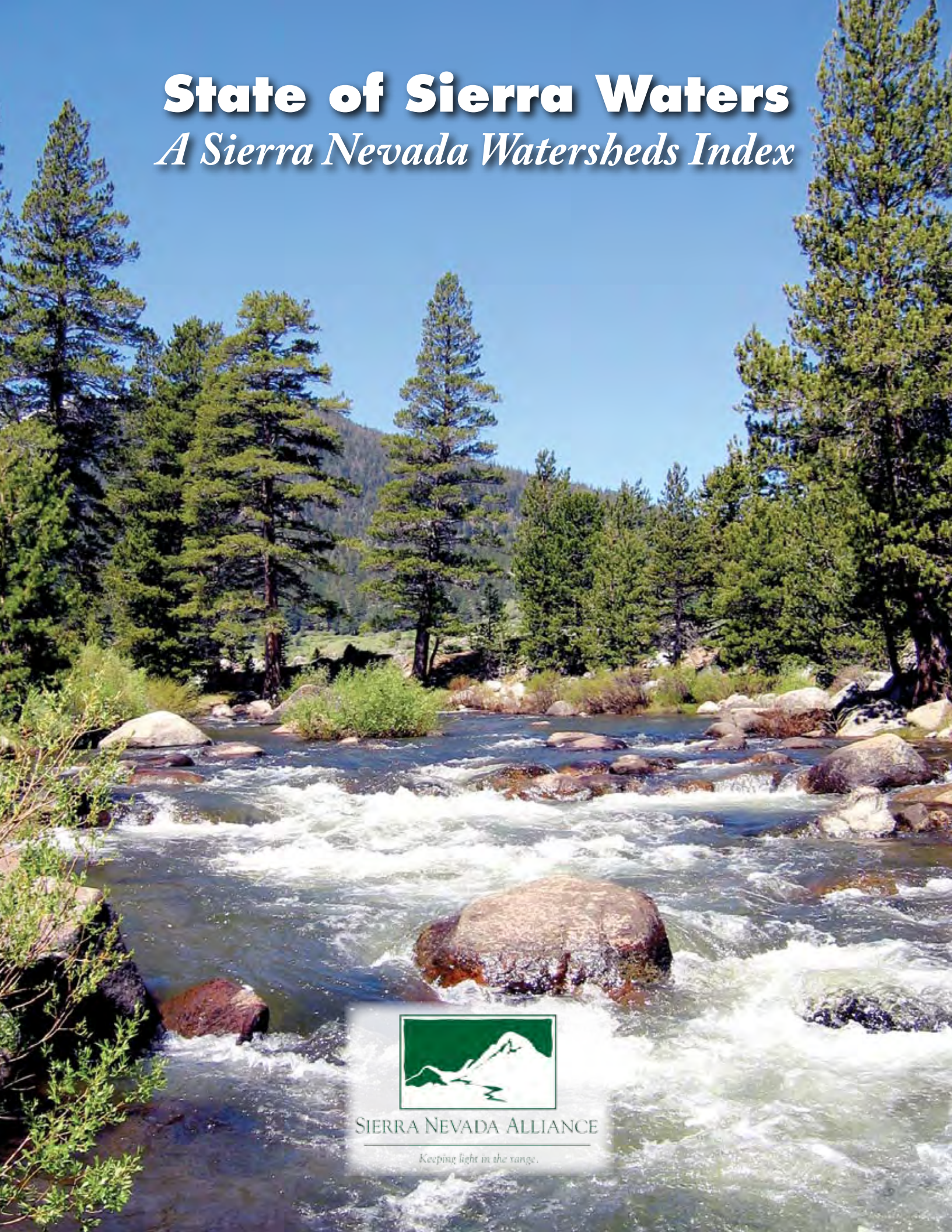
State of Sierra Waters

A Sierra Nevada Watersheds Index



SIERRA NEVADA ALLIANCE

Keeping light in the range.

State of Sierra Waters

A Sierra Nevada Watersheds Index

by Kerri Timmer, Megan Suarez-Brand, Janet Cohen and Joan Clayburgh

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March 2006

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Acknowledgements

Many people contributed comments, insights and experience to this report. Special thanks to our technical advisors: Rick Kattleman, Steve Robinson, Beth Christman, Kathy Russick, and Judith Unsicker.

This report would not have been possible without the support of the National Fish & Wildlife Foundation. Note: "The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S Government or the National Fish and Wildlife Foundation. Mention of trade names or commercial products does not constitute endorsement by the U.S. Government or the National Fish and Wildlife Foundation."

Thanks to Brian White of White's Graphics for design and layout.

We would also like to thank Trevor McProud for his help in research. Thanks also to Terry Manning, Christi Bozora Creegan, Kay Ogden, Autumn Bernstein, and Kathy Haberman for assistance in editing.

The authors bear responsibility for any factual errors. Recommendations and views expressed are those of the Sierra Nevada Alliance and do not necessarily represent those of funders, reviewers, or others who offered assistance to this report.

About the Authors

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Kerri Timmer and Janet Cohen are partners in Sierra Connections – Community Action Partners, a consulting group that offers organizational capacity building, research, writing, and grassroots outreach/communications services to non-profit community-based organizations.

Sierra Nevada Alliance

The Sierra Nevada Alliance has been protecting and restoring Sierra land, water, wildlife and communities since 1993. The Alliance unites hundreds of individuals and conservation groups to protect Sierra resources. The Alliance is driven by a vision of a Sierra where natural and human communities coexist in harmony; a Sierra where residents and visitors alike understand and value the unique qualities of the range and protect the places they love.

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Executive Summary

The Sierra Nevada's water is critical to the health, welfare and, indeed, to the very spirit of California and Nevada. Over 60% of California's and most of Northern Nevada's water supply comes from the Sierra Nevada. The region's rivers, lakes and streams supply consumers, businesses and agriculture. Sierra rivers, lakes and streams also supply prime recreation – whether fishing, swimming, boating or simply marveling in the myriad flows – for residents and visitors alike. And they provide important habitat for wildlife.

While most people believe these majestic waters are pristine and pure, our previous report, *Troubled Waters of the Sierra*, shows that all but one of the Sierra's 24 major watersheds are impaired. This report goes one step farther and establishes indicators the Alliance and others can revisit to track improvements or degradation of this precious resource over the years.

The *State of Sierra Waters 2006* used publicly available data from various state and federal agencies, including US Environmental Protection Agency, US Geological Survey, California State Water Quality Control Board, Nevada Division of Environmental Protection and others. However, readers must keep in mind that the agencies consulted **have not** assessed every stretch of every river in the region for every indicator suggested in this report; nor has this report necessarily uncovered every potential source of information for the indicators listed. Though a particular watershed may not be shown here to have a specific impairment, that does not suggest that an impairment may not actually exist.

Sierra rivers, lakes and streams are degraded

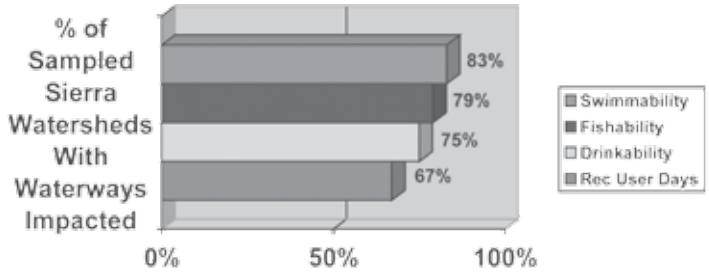
Of the sampled areas three-quarters of Sierra watersheds had stretches that were not swimmable, fishable, drinkable or open for recreation at some point in the last five years!

Based on the research conducted for this report, we know that Sierra rivers, lakes and streams are impaired chemically, biologically, and physically. In some cases stretches of Sierra watersheds no longer adequately support wildlife; in other cases portions of Sierra lakes, rivers and streams have been noted as not supplying clean drinking water or supporting recreational uses such as swimming, boating or fishing. All in all, it's a sad state of affairs for a region that is home to half the wildlife of the state, supplies 60% of California's developed water and attracts over 50-60 million visitor-days to recreate on or near these waters each year. However, what is most striking are the impairments related to human exposure such as fishing, swimming and drinking.

Of the sampled areas three-quarters of Sierra watersheds had stretches that were not swimmable, fishable, drinkable or open for recreation at some point in the last five years!

When people talk about beaches being closed to swimming or fishing or boating or drinking water, most people think of coastal beaches. Coastal waters certainly deserve attention by the media and public of California; but what was most illuminating in the research for this report is that, of the sampled areas, 20 of 24 major rivers in the Sierra had stretches (83% of Sierra rivers) that were closed to *swimming* sometime within the past five years, according to the US Environmental Protection Agency.
And for a region that attracts fisherman from

HUMAN EXPOSURE INDICATORS



Swimmability – water quality that allows for swimming with no harmful effects to humans.

Fishability – water quality that allows for fishing with no harmful effects to humans.

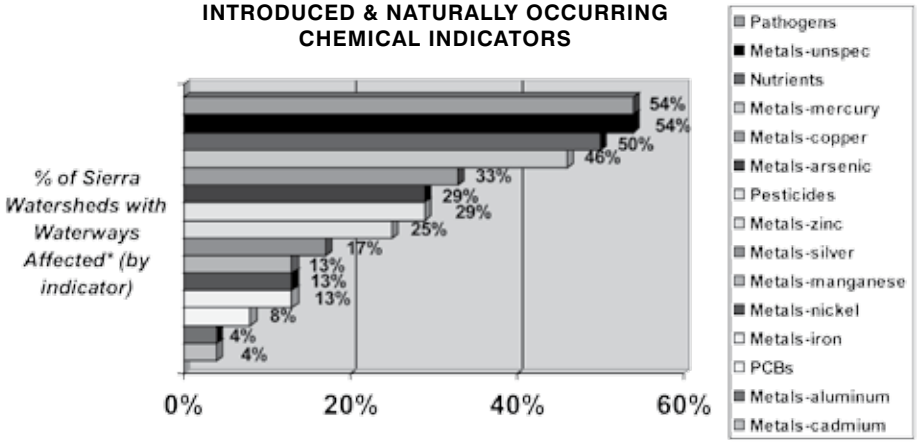
Drinkability – water supply that will yield potable or drinkable water after treatment by public water treatment facilities.

Recreation User Days – days that rivers, lakes and reservoirs are open and available for recreation, such as swimming, boating, fishing, etc.

all over the world – 79% of the sampled Sierra rivers (19 of 24) had stretches with closures or warnings for *fishing*, according to the US Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA), the National Listing of Fish Advisories, and the Nevada Department of Environmental Protection (NDEP). And for a region that supplies almost all of northwestern Nevada's water and 60% of California's – 75% of the sampled rivers in the region (18 of 24 rivers) had stretches that were listed as impacted for *drinking* according to the US Environmental Protection Agency.

The extent of these Clean Water Act violations should be a true wake-up call to California and Nevada to stop thinking that the Sierra Nevada waters are to be taken for granted. The waters of our states, the tourist-dependent communities of the Sierra and our world-class fisheries deserve better stewardship than we have witnessed in the past.

Other region-wide problems affecting more than three-quarters of Sierra watersheds included: impaired wildlife habitats (88%) and concentration of toxics in fish tissue (79%) (which is related to the consumption of contaminated fish). We discuss this further in the Human Exposure section of this chapter. The following represent the additional indicators evaluated in this report.



Pathogens – microorganisms that can cause disease in other organisms or in humans, animals and plants.

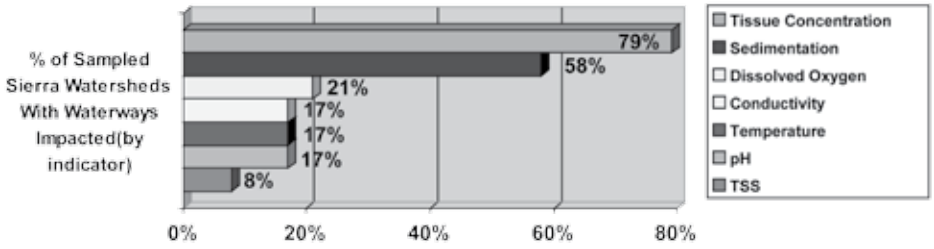
Metals – naturally occurring elements in the Earth's crust that are found in rocks, soils, water and air.

Nutrients – substances that are taken in or assimilated by organisms to promote maintenance or growth.

Pesticides – poisons designed to kill pests such as weeds, insects, birds, rodents, algae, and fungus.

PCBs – mixture of synthetic, toxic industrial chemicals once used in making paint and electrical transformers, which are chemically inert and not biodegradable.

PHYSICAL CHEMISTRY INDICATORS



Tissue Concentration – contaminants that collect and concentrate in the tissue or flesh of fish at levels that are greater than the level of the contaminant in the surrounding water.

Sedimentation – solid particles of soil or other substances (called suspended solids), carried in moving water, which are deposited in the stream bottom when the moving water slows down (as in an eddy or a pool or behind a dam).

Dissolved Oxygen –the amount of oxygen dissolved in water, necessary for aquatic organisms to survive.

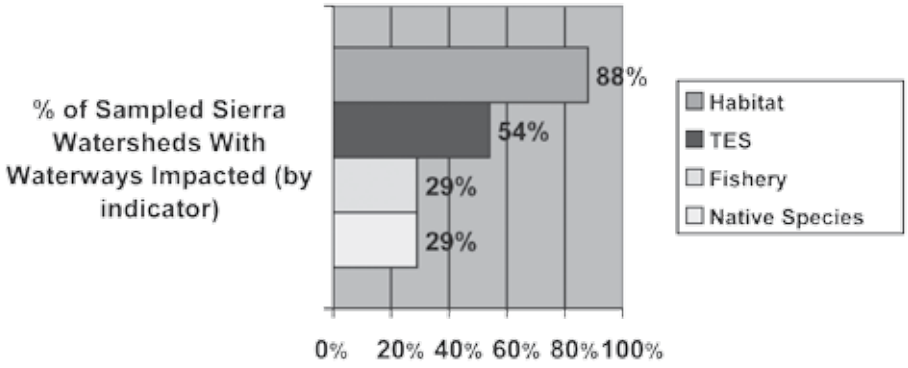
Conductivity – the ability of water to conduct heat or an electrical current.

Temperature – the relative degree of heat or cold in the water that can affect how aquatic plants and animals live and breed.

pH – a measure of the relative acidity or alkalinity of water – water with a pH of 7 is neutral; lower pH levels indicate increasing acidity, while pH levels higher than 7 indicate increasingly basic solutions.

Total Suspended Solids (TSS) – solid particles, such as soil particles, that either float on the surface of the water or are suspended in water.

SPECIES INDICATORS



Habitat – the physical and biological elements of ecosystems that support plant and animal livelihood.

TES (Threatened or Endangered Species) – extent of threatened or endangered species listed in a particular watershed is an indicator of relative risk of extinction of native species; endangered species are those in danger of extinction throughout all or a significant portion of their range; threatened species are those likely to become endangered in the foreseeable future.

Fishery – relative health and abundance of naturally reproducing or stocked populations of specific fish species.

Native Species – the degree of native species, meaning those that originate from a specific area, versus non-natives, or those that migrate or are introduced to an area from outside; non-natives may act as predators, parasites and competition for food and habitat; they may alter essential habitat, resulting in new aquatic communities that can cause imbalance in a previously stable system; and they may threaten human health and economic well-being by altering the ecosystem.

Recommendations

The waters of the Sierra, whose stunning images grace the covers of many calendars and walls, should not be taken for granted. The Sierra Nevada Alliance calls on our national, state, and local leaders as well as citizens of and visitors to the region to invest more in the protection and restoration of our important Sierra watersheds.

The Sierra Nevada Alliance has many recommendations based on the findings of this report. However we would like to highlight the following:

1 **California state government should invest in and provide easily accessible and thorough public data on where, why and for what period of time stretches of Sierra rivers listed were impaired.** In the course of researching this report we could not obtain information with details on why these 303(d) listings occurred. We know the state and regional water boards are aware of this centralized record keeping inadequacy and are interested in centralizing the data. We encourage the state legislature and governor to support the State and regional water board with resources in creating a more thorough and publicly accessible record keeping system.

The State Water Board's Surface Water Ambient Monitoring Program (SWAMP) could be the primary tool to make this data accessible. The SWAMP database could be a data retrieval system in which the public can find information on important factors such as the details of when, where, and why certain stretches are listed as having impairments for human exposure indicators.

2 **We encourage the state of California and the federal government to fund and provide support to local watershed stewardship groups to both help collect data and most importantly implement restoration and protection projects.** These groups have already done a lot and their ability to stretch resources and quickly implement on the ground projects is our best hope at improving Sierra watershed health. These groups span the range, bring strong community partnerships, and can match state and federal resources. It will be impossible for one government agency to address all the impairments noted in this report, however a network of community based watershed groups could be supported to tackle this task.

3 **We encourage businesses and individuals to reduce their pollutants and keep as much soil on their property as possible.** As individuals and businesses we all can have impacts on water quality and at the same time we can do a lot to protect our rivers, lakes and streams. What we do on our own property and when we recreate can reduce pollutant loading and reduce sediment filling our streams. We encourage folks to contact their local watershed group to learn more about best management practices on their properties.

Agencies, organizations, landowners, residents and visitors can all work together to protect the Sierra's treasured water resources. This requires investing in protection of our healthy watersheds to prevent degradation as well as restoring function and quality where degraded. This report's single overriding message is that **Sierra waters cannot be taken for granted and investment of time, money, resources and attention are required by all of us now.** We are all the stewards of the Sierra's wealth of rivers, lakes and streams. Our stewardship will determine how these jewels are passed on to future generations.

Chapter 1:

Introduction

A small group of people interested in the fate of John Muir's famed range of light founded the Sierra Nevada Alliance in 1993 to promote a regional perspective, highlight the region's environmental problems and, most importantly, develop innovative solutions for the region's protection.

Lasting solutions to the Sierra's environmental challenges will depend on policymakers and the public becoming more aware of the significance of the Sierra Nevada, its problems and the need for a range-wide approach to innovative solutions. To help raise this awareness, the Alliance has launched a series of reports on various natural resources to provide ways to measure the relative health of different components making up the ecosystem in which we live.

This *State of Sierra Waters 2006: A Sierra Nevada Watershed Index* is the second in the series of reports on Sierra natural resources. In the spring of 2005 we released *Planning for the Future: A Sierra Nevada Land Use Index*. Each report examines a number of measurements or indicators related to a particular resource, such as Sierra water, land, air or wildlife. These reports are designed to a) help the public, decision-makers and conservation leaders (including Alliance members), assess the health of Sierra resources today and b) establish a baseline for future reference. In years to come, the Alliance will return to these indicators to see what progress has been made in stopping and reversing degradation of our important natural resources.

This *State of Sierra Waters 2006* is a follow-up to the *Troubled Water of the Sierra* report, providing more specific ways of measuring and assessing watershed health for use by people interested in watershed planning and decision-making. The *State of Sierra Waters 2006* also provides a set of baseline data as we know it today for use in measuring change over time – hopefully positive change leading to healthier watershed conditions. We chose a detailed set of indicators that hopefully can easily be replicated over time to track change. This report also identifies elements the Alliance believes watershed stewards **could** be measuring but aren't at this time.

This report also looks at the 24 major watersheds whose headwaters are located in the Sierra Nevada. These watersheds were originally identified in the *SNEP Report* using the State of California's Calwater watershed delineation system.

The *State of Sierra Waters 2006* used publicly available data from various state and federal agencies, including US Environmental Protection Agency, US Geological Survey, California State Water Quality Control Board, Nevada Division of Environmental Protection and others. However, readers must keep in mind that the agencies consulted **have not** monitored every stretch of every river in the region for every indicator suggested in this report; nor has this report necessarily uncovered every potential source of information for the indicators listed. Therefore, just because a particular watershed isn't shown here to have had a specific impairment, does not mean that the impairment does not exist.

Even though one of the only standardized analysis tools in the range is the California State Water Board, Nevada Department of Environmental Protection and US EPA 303(d) and 305(b) lists, there are still limitations with these data sources. Listing criteria for both of these lists has changed over time. For example, in the past the California Lahontan Regional Board listings have been based on qualitative best professional judgment rather than quantitative data.

In 2004, California adopted a statewide "listing policy" **http://www.waterboards.ca.gov/tmdl/docs/ffed_303d_listingpolicy093004.pdf**; however, prior to the establishment of the statewide listing policy there was no detailed statewide guidance on what should or should not be listed, and on top of that the criteria used for listing varied from Regional Board to Regional Board. In the Sierra we had two different California Regional Boards using two different sets of "professional judgment" in listing stretches of rivers and lakes as impaired.

In addition, the 303(d) lists did not provide details of exactly where on a watershed the impairment occurred, for what period the waterways were affected, and what the specific cause of the impairment was. The Alliance attempted to find this information but no centralized or other public accessible data was found in our numerous inquiries. We will speak more to this issue in our recommendations.

Chapter 2:

Sierra Water at a Glance

Water, in all its forms, is indeed the crowning glory of the Sierra. Whether in motion or at rest, the waters of the Sierra are a constant joy to the beholder. Above all, they are the Sierra's greatest contribution to human welfare.

History of the Sierra Nevada, F. Farquhar (1965)

Sierra Watersheds

The Sierra Nevada is made up of 24 major watersheds, according to Calwater, California's system of identifying and delineating watershed boundaries. (See Figure A – Sierra Watersheds map). A *watershed* is an area of land and water that captures precipitation and funnels it into a particular body of water, such as a stream, river or lake. Watersheds come in all sizes, with smaller watersheds combining to create larger ones. Running north to south, the 24 major watersheds of the Sierra are:

Western Sierra	Eastern Sierra
1. Upper Sacramento	17. Eagle Lake
2. Feather	18. Honey Lake
3. Yuba	19. Truckee
4. American	20. Carson
5. Cosumnes	21. Walker
6. Mokelumne	22. Mono Basin
7. Calaveras	23. Owens
8. Stanislaus	24. Mojave
9. Tuolumne	
10. Merced	
11. San Joaquin	
12. Kings	
13. Kaweah	
14. Tule	
15. Kern	
16. Caliente	

Figure A – Sierra Watersheds map

Value of Sierra Water

Water Export

Water is the top resource exported from the Sierra Nevada, according to the *Sierra Nevada Ecosystem Project Report (SNEP Report)*. **Water from the Sierra accounts for 60% of the total dollar value of all natural products or services produced by the entire region** – more than forest products, agricultural products, recreational services or even residential development.[1] The direct value of this water for irrigation, municipal and hydroelectric use is $1.3 billion a year, based solely on the value of the actual water rights.[2] Add to that the revenue generated by the value-added sale or use of that water – such as the electricity generated, the crops produced, the stored water sold or the water-based recreation provided – and the figure increases dramatically.

Wildlife Habitat

In addition to supporting human communities, water from the Sierra Nevada supports a wide range of plant and animal life as well. Some 17% of the plants, 21% of the animals and **all** of the aquatic species depend directly on the Sierra's rivers, lakes, streams and *riparian* habitat – that is, areas adjacent to streams, lakes and other wet areas – for their immediate survival. In addition, water and riparian areas in the Sierra provide food, nutrients and other necessary elements to the larger ecosystem, not to mention creating buffer areas to minimize impacts of nearby land uses.[3]

For example, the Sierra Nevada contains more than 3,500 native plant species, a number representing more than half of all plant species found in California. Of that total, approximately 400 species are *endemic* to the Sierra, meaning they are found **only** in the Sierra Nevada region and not in any other parts of California.[4]

The region is also home to 400 species of land-based creatures, or *terrestrial vertebrates*, including birds, mammals, reptiles and amphibians. Approximately 13 of those species are found only in the Sierra.[5] There are also 40 native fish species and at least 30, fish living in the rivers, lakes and streams of the Sierra. Another 321 types of aquatic insects – the caddisflies and stoneflies so popular with anglers – live in and around the waters of the Sierra. Nineteen percent of the caddisflies and one-quarter of the stoneflies are found only in the Sierra and nowhere else in California. [6]

Recreation/Tourism

Along with export and habitat uses, the waters of the Sierra also provide many of the recreational and tourism-related activities people associate with the Sierra. People from all over California, Nevada and the rest of the country and the world come to the Sierra Nevada for fun, relaxation and rejuvenation. **With some 50 to 60 million visits a year, the Sierra is a backyard playground, of sorts, for people from all over.**[7]

Many of these visits center around water – either directly or indirectly. Direct water recreation includes fishing, motorized boating, swimming, rafting/kayaking/canoeing, gold panning, sailing and other actions that take place in or on the water. Winter activities like skiing, skating or snowmobiling also fall into this category. Other activities, such as golfing, rely heavily on Sierra water, too, for greens maintenance, water features, etc. Activities such as wildlife viewing, picnicking, camping, hiking, trail riding, etc., are more indirect, focusing more on the aesthetic enjoyment of having water nearby.[8]

For some Sierra counties, recreation/tourism is the single most important activity fueling the local economy.

In addition to the aesthetic values, water-based recreation and tourism spending in the region contribute greatly to the local economies within the Sierra. A study by the Sierra Business Council, titled *Sierra Nevada Wealth Index (1999-2000 edition)*, reports that jobs supporting recreation and tourism activities (such as those in the hotel, restaurant, retail, gasoline service station, outdoor recreation, agricultural and cultural tourism fields) account for 16% of the annual estimated payroll value in the Sierra; the same business sectors account for only 3% of total payroll elsewhere in California. For some Sierra counties, recreation/tourism is the single most important activity fueling the local economy.[9]

The SNEP Report identifies recreational fishing and whitewater rafting as the two most significant recreational uses of Sierra Nevada water. Based on what people are willing to pay to participate in these two activities, the annual value of water for recreational fishing and rafting in the Sierra is $250 million. Fishing, alone, accounts for close to $200 million of that amount, according to the US Forest Service's travel cost method of accounting. Travel-cost accounting estimates the value of a day of fishing at $18.96 – multiplied by the total number of fishing days in a year. Whitewater rafting generates approximately $50 million a year, according to the SNEP Report. This calculation is based on the assumption that approximately two-thirds of the rafting trips are commercially guided, valued at $80 a day, and one-third are private trips with some kind of daily multiplier to account for food and other purchases to support the trip. [10]

Water Development in the Sierra

In terms of actual water flow, the watersheds of the Sierra generate roughly 20 million acre-feet[11] a year or 30% of California's annual surface runoff (*surface runoff* is water from rainfall and snowmelt that flows on the surface of the land in rivers, lakes and streams, as opposed to *groundwater* that seeps into the ground and moves subterraneously). That percentage doubles to 60% or 65% when you consider the amount of stored water California residents and farmers consume each year from the vast network of dams and reservoirs found in the lower reaches of most of these watersheds.

It takes an extensive system of federal, state and local dams, reservoirs, canals and aqueducts to capture and move water from the mountains of the Sierra Nevada – where 75% of California's rain and snow falls – to the thirsty central and southern parts of California – where 80% of the agricultural and residential demand exists.[12] The same is true for Nevada, which moves water from the Sierra crest to fast-growing parts of western Nevada to meet agricultural and residential needs.

Various public and private entities have built water development, storage and distribution projects over the years to facilitate this grand movement of water from the mountains of the Sierra region to other parts of California and Nevada.

Commercial water development in California got its start in the mining era, when intrepid miners realized they could get more gold if they worked together to move rivers and streams out of their existing beds to uncover gold deposits or used pressurized water to wash the gold out of the hillsides and into waiting sluice boxes. Beginning in the 1850s, these entrepreneurs dammed upstream tributaries to many Sierra streams in order to hold back water. Then they built extensive ditch and flume systems to move that stored water to specific "hydraulicking" sites where they used it to blast away at the hills to uncover more gold.[13] By 1879 Nevada County alone had 900 miles of ditches valued at $7 million.[14]

Although the famous Sawyer Decision outlawed hydraulic mining in 1884[15] – because of the damage being done by silt and debris washing down the river and covering agricultural lands in the Sacramento Valley – the upstream dams and flumes were still useful. In fact, the system of dams, reservoirs, canals and flumes in the Yuba watershed served as the genesis for what eventually became PG&E, the Pacific Gas and Electric Company. Before it incorporated in 1905 as PG&E, the then-South Yuba Canal Company built its first long distance energy transmission line in 1895 to convey hydroelectric power to the Bay Area from Spaulding Dam on the South Yuba River.[16]

The two major water delivery systems in California today are the federal Central Valley Project (CVP) and the State Water Project (SWP). Local water developers for their individual customers built other projects, such as the Colorado River Aqueduct and the San Francisco and East Bay Aqueducts.

California's Central Valley Project

California's Central Valley Project was approved in 1937 and finished construction in 1951. This system of 20 dams and reservoirs stores up to 11,000,000 acre-feet of water for irrigation of farmland in the California's Central Valley. The federal dams and reservoirs making up this project, along with four combined federal and state reservoirs, deliver some 7,000,000 acre-feet of water total, with 95% of that going to irrigate 3,000,000 acres of farmland a year. The remaining 5% is used by urban residents and for power generation and recreation.[17]

The federal Bureau of Reclamation and Army Corps of Engineers constructed major federal dams and diversions in 13 of the 24 Sierra watersheds to supply the CVP project and other federal water projects. (See Table 2.1 for list of dams/diversions in Sierra).[18]

Table 2.1 Federal Water Projects in the Sierra

SIERRA WATERSHED	FEDERAL DAMS/RESERVOIRS/ DIVERSIONS
Sacramento	Shasta Dam & Reservoir
	Corning Canal
	Tehama/Colusa Canal
Yuba	Englebright Dam & Reservoir
American	Folsom Dam & Reservoir
	Nimbus Dam
	Folsom S Canal
Truckee	Stampede Dam & Reservoir
	Prosser Creek Dam & Reservoir
	Martis Creek Dam & Reservoir
	Boca Dam & Reservoir
Cosumnes	Jenkinson Lake Dam & Reservoir
Calaveras	New Hogan Dam & Reservoir
Stanislaus	New Melones Dam & Reservoir
San Joaquin	Eastman Lake Dam & Reservoir (Chowchilla River)
	Hensley Lake Dam & Reservoir (Fresno River)
	Friant Dam & Millerton Reservoir
	Madera Canal
Kings	Pine Flat Dam & Reservoir
	Friant-Kern Canal
Kaweah	Lake Kaweah Dam & Reservoir
Tule	Lake Success Dam & Reservoir
Kern	Lake Isabella Dam & Reservoir
Mojave	Mojave River Dam & Reservoir

Source: California Water Map (2001)

California's State Water Project

California's State Water Project (SWP) grew out of the Burns-Porter Act of 1960, in which California voters authorized a $1.75 billion bond issue to construct dams, reservoirs, levee improvements, drainage facilities, fish hatcheries, and the California Aqueduct to carry water over 400 miles from the Delta to southern California (see Table 2.2 for projects). The SWP delivers 3,000,000 acre-feet of water each year. Thirty percent of that goes to irrigation, primarily in the San Joaquin Valley, and the balance is used for residential, municipal and industrial activities in the Bay Area and southern California.[19]

Upwards of 20 million Californians (approximately 2/3 of the state's residents) get at least some portion of their water needs met through the SWP, via contracts with local water agencies.[20] The SWP facilities (excluding canals and the California Aqueduct) were built primarily in the Feather River and Kern River watersheds.[21]

Table 2.2 State of California Water Projects in the Sierra

SIERRA WATERSHED	STATE DAMS/RESERVOIRS/ DIVERSIONS
Feather	Antelope Lake Dam & Reservoir
	Lake Davis Dam & Reservoir
	Frenchman Lake Dam & Reservoir
	Oroville Dam & Reservoir
Kern	Kern Water Bank (underground storage)

Source: California Water Map (2001)

State of Nevada

In the state of Nevada, the water issues are similar to those of California in that water demand is met by moving water not only from one part of the state to another, but also into Nevada from neighboring states. The Nevada Department of Conservation and Natural Resources reports that 40% of the annual yield calculated for Nevada's rivers and streams comes from water originating in adjoining states. Rivers with their headwaters in the California Sierra (Truckee, Carson, Walker) comprise a substantial portion of this amount, with the rest coming from the Colorado River (see Table 2.3 for list of Sierra projects serving State of Nevada). Case in point – the Colorado and Truckee rivers together provide drinking water to 85% of all Nevada residents by supplying the vast urban areas of Las Vegas and Reno-Sparks.[22]

In recognition of this interdependence, the two states signed the California-Nevada Interstate Compact in 1971 to codify water rights on the Truckee, Carson and Walker rivers. This agreement established that 90% of the water from the Truckee and 80% of any additional or "future" yield from the Carson in excess of water already required to satisfy existing uses, is to be allocated to Nevada.[23]

Similarly in the Walker River watershed, estimates are that irrigation in Nevada accounts for 90% of the total amount of water used from this river system.[24]

Table 2.3 Sierra Water Projects Serving the State of Nevada

SIERRA WATERSHED	DAMS/RESERVOIRS/DIVERSIONS SUPPLYING NEVADA
Truckee	Lake Tahoe Dam
	Donner Lake Dam
	Prosser Creek Dam & Reservoir
	Independence Lake Dam
	Stampede Dam & Reservoir
	Boca Reservoir
	Floriston Diversion Dam
Carson	Diamond Valley Irrigation Ditches
	15 small reservoirs of 500 acre-ft or less capacity
	Heenan Lake
Walker	Bridgeport Reservoir
	Topaz Reservoir Diversion Canal
	Topaz Reservoir
	Poore Lake/Reservoir
	Upper Twin Lake Reservoir
	Lower Twin Lake Reservoir
	3 small reservoirs of 500 acre-ft or less capacity
	Various irrigation diversion ditches

Source: Nevada Natural Resources Status Report (2002)

Cities/Local Districts

At the local level, another 600 cities and local water districts throughout California built their own storage and delivery facilities that account for about 70% of California's annual water supply.[25] Local funding has allowed for dams, reservoirs and other facilities in 12 of the Sierra's 24 major watersheds. (See Table 2.4 for a list of local water projects in the Sierra). [26]

Table 2.4 Local Water Projects in the Sierra

SIERRA WATERSHED	LOCAL DAMS/RESERVOIRS/DIVERSIONS
Sacramento	Box Canyon Dam & Reservoir
Feather	Mountain Meadows Dam & Reservoir
	Lake Almanor Dam & Reservoir
	Butt Valley Dam & Reservoir
	Bucks Lake Dam & Reservoir
	Paradise Dam & Reservoir
	Little Grass Valley Dam & Reservoir
	Sly Creek Dam & Reservoir
	Lake Wyandotte Dam & Reservoir
Yuba	Jackson Meadows Dam & Reservoir
	Bowman Lake Dam & Reservoir
	Spaulding Dam & Reservoir
	New Bullards Bar Dam & Reservoir
	Upper and Lower Scotts Flat Dams & Reservoirs
	Rollins Dam & Reservoir
	Camp Far West Dam & Reservoir
American	Sugar Pine Dam & Reservoir
	French Meadows Dam & Reservoir
	Hell-Hole Dam & Reservoir
	Loon Lake Dam & Reservoir
	Stumpy Meadow Dam & Reservoir
	Union Valley Dam & Reservoir
	Ice House Dam & Reservoir
	Chili Bar Dam & Reservoir
Mokelumne	Silver Lake Dam & Reservoir
	Lower Bear Lake Dam & Reservoir
	Salt Spring Dam & Reservoir
	Pardee Dam & Reservoir
	Camanche Dam & Reservoir
	Mokelumne Aqueduct
Stanislaus	Spicer Meadow Dam & Reservoir
	Donnells Dam & Reservoir
	Beardsley Lake Dam & Reservoir
	Lyons Dam & Reservoir
	Tulloch Dam & Reservoir

Table 2.4 Continued From Previous Page

SIERRA WATERSHED	LOCAL DAMS/RESERVOIRS/ DIVERSIONS
Tuolumne	Lake Lloyd Dam & Reservoir
	Lake Eleanor Dam & Reservoir
	Hetch Hetchy Dam & Reservoir
	Hetch Hetchy Aqueduct
	New Don Pedro Dam & Reservoir
Merced	New Exchequer Dam and Lake McClure Reservoir
Mono	Lee Vining Intake and Tunnel
	Grant Lake Dam & Reservoir
San Joaquin	Thomas A. Edison Lake Dam & Reservoir
	Florence Lake Dam & Reservoir
	Mammoth Pool Dam & Reservoir
	Huntington Lake Dam & Reservoir
	Shaver Lake Dam & Reservoir
	Bass Lake Dam & Reservoir
Kings	Courtright Dam & Reservoir
	Courtright Dam & Reservoir
Owens	Lake Crowley Dam & Reservoir
	leasant Valley Dam, Reservoir & Power Plants
	Lake Sabrina Dam & Reservoir
	South Lake Dam & Reservoir
	Tinemaha Dam & Reservoir
	Los Angeles Aqueduct
	No. and So. Haiwee Dams & Reservoirs
	Haiwee Power Plant

Source: California Water Map (2001)

Threats to Water Quality/Quantity

Many people assume that the high mountain watersheds of the Sierra Nevada are pure and pristine. But impacts from early development, such as mining, logging, railroad construction, etc. – sometimes referred to as "legacy" impacts – as well as the effects of more recent human activity, remain a problem throughout the region. The *Sierra Nevada* Ecosystem Project report, for example, points out that riparian areas are the most altered and impaired parts of the ecosystem in the Sierra.27 Dams, ditches, flumes, roads and other structures have changed the shape, flow, temperature and quality of our rivers and streams. Such manipulation of our streams for water supply, irrigation, transportation, hydropower, waste disposal, mining, flood control, timber harvest, recreation and other uses has degraded watersheds throughout California, but especially in the Sierra, according to the summary of the *SNEP Report*.

The Sierra Nevada Ecosystem Project report, for example, points out that riparian areas are the most altered and impaired parts of the ecosystem in the Sierra.

As described in the Sierra Nevada Alliance's *Troubled Water of the Sierra* report, every Sierra watershed but one – the Cosumnes – has been identified by government agencies or other scientific sources as significantly impaired in some way.

For example, the California State Water Resources Control Board tracks water quality in selected areas of watersheds found throughout the state. Of the 24 major watersheds in the Sierra region, 11 contain at least one river, stream or lake that is impaired by pollution (metals, nitrogen, phosphorous, mercury, sedimentation/siltation, salinity, chlorides, flow or habitat alterations, pathogens, etc.). And in the *SNEP Report's* Index of Biotic Integrity, which uses the presence of various important fish communities to measure relative watershed health, less than one-third of the Sierra's 24 major watersheds received scores indicating "good" watershed quality. [For more detail on these measures of watershed health, please see the Alliance's *Troubled Water of the Sierra* report (2003), available at **www.sierranevadaalliance.org**.]

Chapter 3:

Sierra Watershed Indicators – Our Methodology

It is beyond the scope of most individual watershed groups to physically analyze all the components in a given watershed to determine its relative health or condition. It would be even more difficult to do the same for all 24 Sierra watersheds and their major tributaries, which is the Alliance's interest. So instead, we selected a smaller number of *indicators* or attributes to represent the overall health of the system. In this case, the measures encompass a series of human exposure, introduced & naturally occurring chemicals (e.g. trace inorganic, organic chemicals and nutrient concentrations), physical chemistry (e.g. chemical and physical characteristics on the water, air, soil and sediment), species, and hydrology/geomorphology.

These attributes can help everyone better understand

a) the overall state of each watershed,

b) where human activities may be impacting water quality, and

c) where conservation, restoration or other activities may help mitigate those impacts.

Indicators

Human Exposure indicators track events like toxic spills, extent/degree/type of recreational uses, fish advisories, etc., that could affect human health based on direct (eating/drinking) or indirect (swimming/boating) contact.

Introduced & Naturally Occurring Chemicals (e.g. trace inorganic, organic chemicals and nutrient concentrations) indicators measure key chemical elements introduced into the aquatic system – such as metals (copper, zinc, lead, mercury), oils, pesticides, and nutrients (nitrogen and phosphorous) – that find their way into water bodies from sources outside the water body itself. Such information can be helpful in determining potential causes and sources of pollution or water quality impairment.

Physical Chemistry indicators measure characteristics of the water that can affect organisms that live in the water (i.e.: fish, insects and algae), such as temperature (which can affect reproduction), the amount of dissolved oxygen in the water (which affects respiration), sedimentation (affecting fish spawning), and other elements.

Species information measures presence/absence and condition of different key species, both native and non-native, as an indicator of relative health of the overall system. In some cases, a known indicator species, such as daphnia (water flea), is exposed to particular concentrations of water taken from a given water body to

Indicators Cont.

determine whether poor water quality results from toxins in the water or rather from degradation of the whole system.

Hydrology/Geomorphology indicators measure the physical features or characteristics of a particular water body that could impact overall health, such as width and depth, water flow, physical alterations to that flow (e.g. dams, diversions), groundwater, extent of wetland areas, percent of different kinds of cover surrounding the water body (from different vegetation types to urban/impervious cover), road/stream crossings, road proximity, streambank stability, erosion hazard, and surrounding land uses. Physical data is often used to augment and/or help interpret other types of data collected.

Indicators are factors that are quantifiable and measurable and, when taken together, help paint a picture of each watershed and identify areas that may need more attention or different management to achieve overall watershed health goals.

Indicators for this report were chosen based on:

1) an initial literature search at the local, national and international levels to see how other organizations measured watershed health and what indicators they used that fit the above characteristics;

2) identification of those indicators that would make sense for the Sierra; and

3) further identification of those indicators for which there was data region-wide, across most or all Sierra watersheds.

Agencies/Entities Surveyed

Bay Institute Ecological Scorecard [www.bay.org/ecological_scorecard.htm]

EPA Environmental Indicators Initiative [www.epa.gov/indicators/roe/index.htm]

Fraser Institute Environmental Indicators [www.fraserinstitute.ca/shared/readmore.sap?sNav=pb&id=314]

Chesapeake Bay Program – Measurable Environmental Commitments [www.chesapeakebay.net/pubs/indpub.appendb.pdf]

Great Lakes Environmental Indicators Project [http://glei.nrri.umn.edu/default/]

National Environmental Performance Partnership System – Environmental Indicators Technical Report [www.scc.rutgers.edu/cei/about PDF%20Files/Env%20 1nd%20Tech%20Report%20June%201998.pdf]

Agencies/Entities Surveyed Cont.

European Environment Agency Environmental Indicators [www.eea.eu.int/main_html]

Australia Department of the Environment – Environmental Indicators [www.deh.gov.au/soe/inland/pubs/inland-ind.pdf]

The Heinz Center – State of the Nation's Ecosystems [www.heinzctr.org]

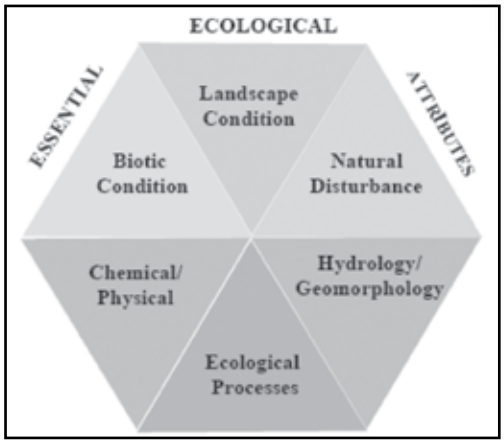
Restore the Rogue (Rogue River, Oregon) – Ecosystem Management Decision Support Model [www.restoretherogue.org/model/index.html]

The indicators chosen represent useful measures that are readily measurable, tracked by existing agencies or entities, and/or that the Alliance believes **could** be measured – even if they aren't being measured or tracked right now – to provide needed information for watershed protection and management decisions now and into the future.

For this report we wanted data that was available and standardized across watersheds. As a result, the primary sources we used for the indicators listed in this report were the California State Water Resources Control Board (SWRCB), the US Environmental Protection Agency (US EPA), the National Oceanic and Atmospheric Administration (NOAA) and the Nevada Department of Environmental Protection. Individual watershed groups and other entities are likely to have more specific and detailed data for their individual watersheds. If you have an interest in a particular watershed, we suggest you contact the watershed groups active in that watershed. For a list of watershed groups in the Sierra please see Appendix A or visit our website at **www.sierranevadaalliance.org/publications/**

In the past, California has tried through various state departments and academic circles to identify and standardize watershed assessment data collection and reporting mechanisms. However, the need for a universal mechanism still exists.[28] Different groups and agencies with different missions collect the data they need (or can afford); but there is no single agency or entity that is responsible for overall watershed data in the State of California, like there is in Oregon, for example, under the Oregon Watershed Enhancement Board (OWEB).[29]

Currently, however the State of California's Resources Agency, Department of Water Resources, and State Water Resources Control Board are considering adopting the US EPA's Science Advisory Board's *Framework for Assessing and Reporting on Ecological Conditions* as a unifying indicators system for California. The framework allows for the comparison of environmental indicator data across different types of data collection and analysis systems.



The purpose of *Framework* is to provide the US EPA and associated agencies with a sample framework that may "serve as a guide for designing a system to assess, and then report on, ecological condition at a local, regional, or national scale". The framework is intended solely as an organizing tool.

More information on the US EPA Science Advisory Board (SAB) *Framework for Assessing and Reporting on Ecological Condition* can be found at **http://www.epa.gov/sab/pdf/epec02009.pdf**

However, the reality is that as of January 2006, indicator data gathered by individual watershed groups and agencies: a) is neither standardized nor uniform across indicators or across watersheds, and b) does not get collected and analyzed in one place, making it very difficult to find consistent, accurate and comparable data across watersheds.

Specific Indicators

The Alliance used the following measures as a baseline to begin tracking watershed indicators in the region. The indicators we chose to use can and do fit within the aforementioned US EPA framework. The Sierra Nevada Alliance hopes that California and Nevada state agencies, NGO's and other monitoring entities adopt the US EPA framework so that we may compare systems in the future.

Unfortunately, we could not find data for every indicator across every watershed. So we broke up the recommended indicators into two groups: those for which we were able to find some data, and those for which there didn't seem to be readily available data – but that the Alliance believes are important to know about when assessing watershed health, determining potential management activities, and/or prioritizing conservation or restoration strategies and locations.

Table 3.1 lists the indicators for which **we were able** to find some data. Table 3.2 lists the additional indicators for which data was not easily accessible and therefore is not used in our report. Both tables identify the recommended indicators and briefly describe what each indicator tells us about water quality and/or watershed health.

Table 3.1 **Indicators analyzed in this report for which some data was available for all watersheds**

INDICATOR	WHAT INDICATOR TELLS US
Human Exposure	
Incidents of toxic releases/ frequency of beach/river postings and closures	Potential public health issue via direct contact (e.g. swimming).
Water quality ("drinkable")	Maintenance of a raw water supply that will yield potable or drinkable water after treatment by public water treatment facilities. Potential public health issue via direct consumption (drinking) or indirect consumption (cooking, bathing, etc.) of contaminated water.
Swimmable	The quality necessary to support safe recreation in and on the water – including all types of water-based recreation.
Fishable	The quality necessary to support the protection and propagation of fish, shellfish, and wildlife and recreational uses, such as fishing.
Recreation user days	Indicator of impact or potential impact on resource.

Table 3.1 Continued From Previous Page

INDICATOR CONT.	WHAT INDICATOR TELLS US CONT.
Introduced & Naturally Occurring Chemicals	
Metals /trace elements: copper, zinc, lead, mercury, arsenic, other	Potential public health issue because metals tend to accumulate in the food chain and low concentrations can damage living things; potential carcinogens; harm to humans, fish, other species. Mercury, in particular, infiltrates food web, making it dangerous to eat fish containing elevated levels. Mercury (in reaction with bacteria) is a developmental toxin that can damage the immune, renal, cardiovascular, and reproductive systems. Especially dangerous to children and pregnant women. Ingesting too much arsenic can lead to lung, bladder, liver, skin and other cancers, as well as damage to the cardiovascular, pulmonary, immune, neurological and endocrine systems.
Nutrients: nitrogen, phosphorous, nitrates	Potential harm to aquatic organisms. Nitrate reactions in fresh water can cause oxygen depletion. Increases algae growth, which blocks sunlight, kills plants and decreases oxygen.
Pathogens: fecal coliform, bacteria	Potential harm to humans. Pathogens indicate the possible presence of disease-causing bacteria, viruses, and protozoans. Encourages increased oxygen demand by microorganisms.
Pesticides	Potential harm to humans, fish, amphibians, and other species. Pesticides can affect suitability of water for drinking; potential public health issue; potential carcinogens and at certain levels can cause reproductive, developmental, hormonal and nervous system harm to humans, fish and other species.
PCBs	Potential public health issue related to eating fish; Harm to human, fish, other species.
Physical Chemistry	
Dissolved Oxygen (DO)	Potential harm to aquatic organisms. DO outside normal ranges may affect species diversity, increase in algae and bacteria and death and reduction in growth of species.
Temperature	Potential harm to aquatic organisms, fish and amphibians. Variations or extremes in temperature can cause potential harm to aquatic organisms, including fish and amphibians. Temperature affects the oxygen content of the water; rate of photosynthesis by aquatic plants; the metabolic rates of aquatic organisms; and the sensitivity of organisms to toxic wastes, parasites, and diseases.

Table 3.1 Continued From Previous Page

INDICATOR CONT.	WHAT INDICATOR TELLS US CONT.
Physical Chemistry Cont.	
pH	pH is a measure of the relative acidity or alkalinity of water. Water with a pH of 7 is neutral; lower pH levels indicate increasing acidity, while pH levels higher than 7 indicate increasingly basic solutions. pH outside normal ranges can cause potential harm to aquatic organisms and reduces the diversity and can also allow toxic elements and compounds to become mobile and "available" for uptake by aquatic plants and animals.
Conductivity	Conductivity is the ability of water to conduct an electrical current through dissolved ions. High conductivity can affect water quality for irrigation or drinking. Can also affect aquatic organisms.
Sediment	Sediment refers to material suspended in water or recently deposited material that was previously suspended in water. Excess sediment can indicate erosion problems, inappropriate agricultural, forestry or building practices. Destroys aquatic habitat by smothering benthic life, clogging fish gills, increasing water temperature and blocking sunlight. Reduces ability of dams/reservoirs to store water and/or generate electricity. Contributes to region-wide pattern of species endangerment.
Tissue concentrations	Accumulation of a contaminant in the tissue or flesh of an organism, such as fish, to levels that are greater than the level of that substance in the water. Potential public health issue. Human health impacts via direct consumption of contaminated fish.
Species	
Native/non-native species	May act as predators, parasites and competition for food and habitat. May alter essential habitat, resulting in new aquatic communities that can cause imbalance in a previously stable system and may threaten human health and economic well being.
Threatened/endangered species	Indicator of relative risk of extinction of native species.
Habitat	Habitat is the place where the physical and biological elements of ecosystems come together to provide a suitable environment – including food, cover and space – needed for plant and animal livelihood. Relative habitat quality is an indicator of expected biological values and ability of the watershed to support other designated uses, such as wildlife, fisheries, etc.
Fishery	Refers to the relative health and abundance of naturally reproducing or stocked populations of specific fish species.

Table 3.1 Continued From Previous Page

INDICATOR CONT.	WHAT INDICATOR TELLS US CONT.
Hydrology/Geomorphology	
Flow alterations: dams, diversions, channelization	Alters ecosystem function and increases habitat fragmentation, alters stream channel condition, disrupts natural flow regimes, and inundates large areas of aquatic and riparian habitat. Impacts lifecycle of water-dependent species; prevents migrating fish species, such as salmon and steelhead, from reaching necessary spawning grounds in higher-elevation streams, forcing them to use less desirable habitat, which affects reproductive success. Also can affect the habitat of bottom-dwelling aquatic insect populations downstream from dams by holding back necessary sediments and nutrients, thereby impacting the food supply for critical life stages of fish.
Groundwater: groundwater levels, permitted withdrawals, private well levels	Underground storage, identifies areas potentially sensitive to further withdrawals. Increased potential for salinity and of wells running dry.
Extent of wetlands	Baseline for future gain/loss measurement; identifies existing areas of high sensitivity. Potential indicator of species loss.

Table 3.2 Additional Indicators for which information *was not centralized* nor readily available for all watersheds in the Sierra. We recommend this data be collected and centrally organized in the future.

INDICATOR	WHAT INDICATOR TELLS US
Human Exposure	
No additional indicators	
Introduced & Naturally Occurring Chemicals	
PAHs (Polycyclic aromatic hydrocarbons)	Potential public health issue; potential carcinogens; related to eating fish. Identified health effects of PAH exposure include cancer and adverse reproductive and developmental effects.
Physical Chemistry	
Total Suspended Solids	Solids that are not in true solution and that can be removed by filtration. Suspended solids usually contribute directly to turbidity. High concentrations of suspended solids can act as transporters of toxins and heavy metals. Suspended solids can also affect water clarity and photosynthesis by aquatic plants. Affects water temperatures and can cause drinking water problems.

Table 3.2 Continued From Previous Page

INDICATOR CONT.	WHAT INDICATOR TELLS US CONT.
Physical Chemistry Cont.	
Turbidity	Turbidity is the amount of small particles of solid matter suspended in water, as measured by the amount of scattering and absorption of light rays caused by the particles. Turbidity is an indicator of the effects of man-made and natural disturbance. High levels affect water clarity and temperatures. Harmful to aquatic organisms.
Species	
Die-offs/deformities	Disruptions to the ecosystem, loss of recreational opportunity. Indicates imbalance in ecosystem.
Plant associations and assemblages	Indicator of ecosystem sustainability and species viability. Indicator of potential habitat.
Loss of keystone species	Indicator of habitat loss and ecological change throughout a system.
Hydrology/geomorphology	
Extent of wetlands	Baseline for future gain/loss measurement; identifies existing areas of high sensitivity. Potential indicator of species loss.
% Urban land cover in riparian areas	Baseline for future gain/loss measurement; identifies areas that could be targets for restoration projects.
% Agricultural lands in riparian areas	Baseline for future gain/loss measurement; identifies potential sources of nutrients and other pollutants.
Extent of freshwater ecosystems	Indication of habitat extent and ecosystem extent and potential ability to provide ecosystem services.
Roads and stream crossings; roads near streams	Indication of pollution potential into streams and rivers.
Erosion hazard	Potential for erosion based on slope, soil type and precipitation.
Flow quantity	Amount of water for various purposes eg: drinking water, irrigation, recreation, habitat needs, etc.
Road and trail density	Amount of roads and trails near rivers; potential for erosion and habitat fragmentation.

Analysis Process

Using the information sources noted in chapter 4, and the list of subwatersheds making up each of the 24 main Sierra watersheds, provided by GreenInfo Network, the Alliance research team surveyed information sites for applicable indicator data, which was entered into an interactive Filemaker Pro database created for this project. Once the data survey was completed, the research team created a series of comparative reports by watershed and by major indicator category – human exposure, introduced and naturally occurring chemicals, physical chemistry, species and hydrology/geomorphology. These reports provide: a) a thorough data gap analysis in terms of which watersheds have what kinds of data available, and b) a description of the nature of impairments in each watershed.

Chapter 4:

Impacted Sierra Watersheds by Indicator

The following chapter reviews each indicator and which Sierra watersheds had stretches that had some degree of threat or impairment related to that indicator.

Addressing specific thresholds or criteria for all 35 indicators was beyond the scope of this report; this report, instead, focuses on providing a snapshot of relative watershed health based primarily on presence or absence of a particular indicator in the watershed, as determined by the key state and federal agencies charged with tracking that indicator.

Descriptive information for the indicators that follow was gathered from the Agency for Toxic Substances and Disease Registry at **www.atsdr.cdc.gov/toxfaq.html**, the USGS Water Science Glossary of Terms at **http://ga.water.usgs.gov/edu/dictionary.html#H** and/or the Water Quality Association Glossary at **http://www.wqa.org/glossary.cfm**, unless otherwise noted.

Specific data on which watersheds are affected by which indicator was gathered primarily from the California State Water Resources Control Board, the US Environmental Protection Agency, the Nevada Department of Environmental Protection and other agency sources, many of which are accessible through the US EPA's WATERS (Watershed Assessment, Tracking & Environmental Results) program at **http://www.epa.gov/waters/data/prog.html**. Indicator data for this report has been collated into an interactive database for future reference and use.

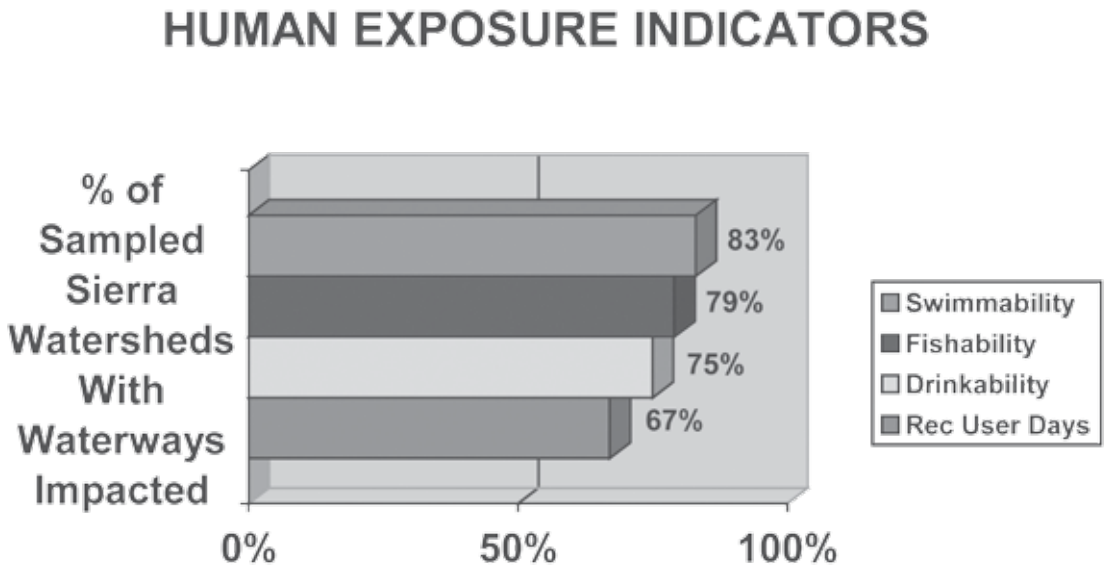
For purposes of this report, we use the US EPA's definitions for the following terms (taken from the EPA's Biocriteria Glossary at **http://www.epa.gov/waterscience/biocriteria/glossary.html)**:

> *impact* – a generic term indicating a change in the chemical, physical (including habitat) or biological quality or condition of a waterbody (including both impairment and/or threat of future impairment) caused by external sources;
>
> *impaired* – a detrimental effect on the biological integrity of a waterbody caused by an impact that prevents support or attainment of the designated use;
>
> *threatened* – watersheds that currently support all of their designated uses, but where one or more of those uses may become impaired in the future (i.e., water quality may be exhibiting a deteriorating trend) if pollution control actions are not taken.

As previously noted, readers should keep in mind that the agencies consulted for indicator data **have not** monitored every river in the region for every indicator suggested in this report. Nor has this report necessarily uncovered every potential source of information for the indicators listed. Therefore just because a particular watershed isn't shown here to have a specific impairment or threat of impairment does not mean that the impairment or threat does not exist.

HUMAN EXPOSURE

Human exposure indicators track events like toxic spills, extent/degree/type of recreational uses, fish advisories, etc., that could affect human health based on direct (eating/drinking) or indirect (swimming/boating) contact.



Swimmability – water quality that allows for swimming with no harmful effects to humans.

Fishability – water quality that allows for fishing with no harmful effects to humans.

Drinkability – water supply that will yield potable or drinkable water after treatment by public water treatment facilities.

Recreation User Days – days that rivers, lakes and reservoirs are open and available for recreation, such as swimming, boating, fishing, etc.

HUMAN EXPOSURE INDICATOR DATA SOURCES

US Environmental Protection Agency (US EPA) – Water Quality Assessment Reports

Data location: *305(b) Water Quality Assessment Reports – Assessed Waters of California by Watershed* **http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=CA#assessed_waters and http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=NV#total_assessed_waters**

US Environmental Protection Agency (US EPA) – National Listing of Fish Advisories

The database includes all available information describing state-, tribal-, and federally issued fish consumption advisories in the United States for the 50 States, the District of Columbia, and four U.S. Territories, and in Canada for the 12 provinces and territories. The database contains information provided to EPA by the states, tribes, territories and Canada.

Data location: **http://www.epa.gov/ost/fish/advisories/index.html or http://epa.gov/waterscience/fish/advisories/**

California Office of Environmental Health Hazard Assessment (OEHHA)

The California Office of Environmental Health Hazard Assessment (OEHHA) provides both general fish consumption guidelines and guidelines or advisories specific to particular locations. California bases these human health risk assessments on laboratory testing data and monitoring for toxic substances in fish tissue. OEHHA and the California Sport Fishing Regulations published by the Fish and Game Commission and the California Department of Fish and Game have issued various health advisories over the years.

OEHHA also performs major risk assessment and hazard evaluation activities relating to chemical contaminants in drinking water, in cooperation with the Regional Water Quality Control Boards, the US EPA, the California Department of Health Services, County Health Departments' local water districts and others. These activities include developing health advisories, action levels, and public health goals for chemical substances in drinking water, and providing toxicological assistance for chemical monitoring activities for the drinking water supply.

Data location: **http://www.oehha.ca.gov/home.html and http://www.oehha.ca.gov/fish.html and http://www.oehha.ca.gov/fish/so_cal/nosierra.html and http://www.oehha.ca.gov/fish/so_cal/fnatoma.html**

California State Water Resources Control Board (SWRCB/RWQCBs)

Data location: *2002 CWA Section 303(d) List of Water Quality Limited Segments* (Lahontan Region 6) – approved by US EPA July 2003 **http://www.waterboards.ca.gov/tmdl/docs/2002reg6303dlist.pdf**

2002 CWA Section 303(d) List of Water Quality Limited Segments (Central Valley Region 5) **http://www.waterboards.ca.gov/tmdl/docs/2002reg5303dlist.pdf**

Nevada Division of Environmental Protection (NDEP) – Bureau of Water Quality Planning (BWQP)

Data location: **http://ndep.nv.gov/bwqp/file/305b2004.pdf**

HUMAN EXPOSURE INDICATORS

Swimmability

Of the sampled area 83% of Sierra watersheds had stretches (20 of 24) that are negatively affected for swimmability.

Of the sampled area 83% of Sierra watersheds had stretches (20 of 24) that are negatively affected for swimmability.

The federal Clean Water Act defines *fishable* and *swimmable* as water quality that: a) provides for the protection and propagation of fish, shellfish, and wildlife and b) provides for recreation in and on the water. *Swimmable* is understood to mean the water quality necessary to support safe recreation in and on the water—and includes all types of water-based recreation.

Swimmable basically means that people can swim and/or enjoy other water-based activities, such as

kayaking in a waterbody, without risk of adverse human health effects, such as catching waterborne diseases from raw sewage contamination.

Table 4.1 Sampled Watersheds with Stretches Negatively Affected for Swimmability

WATERSHED	SPECIFIC WATERBODY
American	Folsom Reservoir
Carson	Indian Creek
Feather	Feather River, Middle Fork
	Feather River, North Fork
	Feather River, North Fork – East Branch
	Feather River, South Fork
Honey Lake	Honey Lake
Kaweah	Kaweah Lake
	Kaweah River, Lower
Kern	Isabella Reservoir
	Kern River, Lower
Kings	Kings River, South Fork/10 Mile Creek
	Pine Flat Reservoir
Merced	McClure Reservoir
	Merced River, Upper
Mojave	Mojave River, West Fork
Mokelumne	Mokelumne River, Upper
Mono Basin	June Lake
	Lee Vining Creek
	Mill Creek
	Mono Lake
Owens	Crowley Lake
	Haiwee Reservoir
	Hot Creek
	Owens Lake
	Owens River
	Tinemaha Reservoir
Sac Upper	Shasta Reservoir
	Upper Sacramento River, above Shasta
San Joaquin	Bass Lake
	Willow Creek
Stanislaus	Stanislaus River
Truckee	Blackwood Creek
	Bronco Creek

Table 4.1 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
Truckee Cont.	Donner Lake Gray Creek Heavenly Valley Creek Lake Tahoe Martis Creek Squaw Creek Truckee River
Tule	Success Lake Tule River
Tuolumne	Don Pedro Reservoir Dunn Creek Tuolumne River
Walker	Bridgeport Reservoir East Walker River, above Bridgeport East Walker River, below Bridgeport Robinson Creek Swauger Creek Topaz Lake West Walker River
Yuba	Bullards Bar Reservoir Camp Far West Reservoir Englebright Reservoir Humbug Creek Little Deer Creek Rollins Reservoir Scotts Flat Reservoir South Fork Yuba River, above Edwards South Fork Yuba River, below Edwards Wolf Creek

Fishability

Of the sampled areas almost 79% (19 of 24) of Sierra watersheds had stretches that are affected by impacts to fishability.

Of the sampled areas almost 79% (19 of 24) of Sierra watersheds had stretches that are affected by impacts to fishability.

The federal Clean Water Act defines *fishable* as water quality that provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water.

While most of the nation's waters contain fish that are safe to eat, a consumption advisory may

recommend that people limit or avoid eating certain species of fish caught from certain lakes, rivers or coastal waters. Such advisories impact a water body's *fishability*. In some cases, advisories apply to specific water types (such as lakes), or they may include recommendations for specific groups like pregnant women or children. Advisories apply to locally caught fish or water-dependent wildlife and sometimes apply to fish purchased in stores and restaurants. Statewide advisories are also issued by many states: they warn the public of possible risks from eating certain species from certain types of waters.

Most advisories affecting fishability involve five primary contaminants: mercury, polychlorinated biphenyls (PCBs), chlordane, dioxins, and dichloro-diphenyl-trichloroethane (DDT). These chemical contaminants persist for long periods in sediments where bottom-dwelling animals accumulate and pass them up the food chain to fish. Levels of these contaminants may increase as they move up the food chain, so top predators in a food chain (such as largemouth bass or walleye) may have levels a million times higher than that in the water.

Table 4.2 **Sampled Watersheds with Stretches Negatively Affected for Fishability**

WATERSHED	SPECIFIC WATERBODY
American	American River, Lower
	Folsom Reservoir
Carson	Carson River, Main, NV
	Carson River, East Fork
	Carson River, West Fork
Eagle Lake	Eagle Lake
Feather	Feather River, Middle Fork
	Feather River, North Fork
	Feather River, North Fork – East Branch
	Feather River, South Fork
Honey Lake	Susan River
Kaweah	Kaweah River, Lower
Kern	Isabella Reservoir
	Kern River, Lower
Kings	Pine Flat Reservoir
Merced	McClure Reservoir
Mokelumne	Mokelumne River, Upper
Mono Basin	June Lake
	Mill Creek
Owens	Crowley Lake
	Haiwee Reservoir
	Hot Creek
	Mammoth Creek
	Tinemaha Reservoir
	Tuttle Creek

Table 4.2 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
Sac Upper	Upper Sacramento River, above Shasta
Stanislaus	Stanislaus River
Truckee	Boca Reservoir Donner Lake Lake Tahoe Little Truckee Squaw Creek Stampede Reservoir Truckee River
Tule	Tule River
Tuolumne	Don Pedro Reservoir Dunn Creek Tuolumne River
Walker	Aurora Canyon Creek Bodie Creek East Walker River, above Bridgeport East Walker River, below Bridgeport Green Creek
Yuba	Bear River, Lower Bear River, Upper Bullards Bar Reservoir Camp Far West Reservoir Combie Reservoir Englebright Reservoir Little Deer Creek Rollins Reservoir Scotts Flat Reservoir Yuba River, South Fork above Edwards

Drinkability

Of the sampled areas 75% of Sierra watersheds had stretches (18 of 24) where drinking water was impaired.

Drinkability means maintaining a water supply that will yield potable or drinkable water after treatment by public water treatment facilities.

Impacts to drinkability can result in potential public health issues via direct consumption (drinking) or indirect consumption (cooking, bathing, etc.) of contaminated water.

Of the sampled areas 75% of Sierra watersheds had stretches (18 of 24) where drinking water was impaired.

Table 4.3 Sampled Watersheds with Stretches where Drinking Water Was Impaired

WATERSHED	SPECIFIC WATERBODY
American	Folsom Reservoir
Carson	Carson River, East Fork
	Indian Creek
Feather	Feather River, Middle Fork
	Feather River, North Fork
	Feather River, South Fork
Honey Lake	Honey Lake Wetlands
Kaweah	Kaweah River, Lower
Kern	Kern River, Lower
Merced	McClure Reservoir
	Merced River, Upper
Mojave	Mojave River, West Fork
Mokelumne	Mokelumne River, Upper
Mono Basin	June Lake
Owens	Crowley Lake
	Haiwee Reservoir
	Hot Creek
	Owens Lake
	Owens River
San Joaquin	Willow Creek
Stanislaus	Stanislaus River
Truckee	Blackwood Creek
	Bronco Creek
	Cinder Cone Springs
	Donner Lake
	Gray Creek
	Lake Tahoe
	Martis Creek
	Squaw Creek
	Trout Creek
	Truckee River
	Ward Creek
Tule	Tule River
Tuolumne	Dunn Creek
	Tuolumne River
Walker	Bodie Creek
	East Walker River, above Bridgeport
	East Walker River, below Bridgeport
	Robinson Creek
	Robinson Creek

Table 4.3 Continued from Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
Walker Cont.	Swauger Creek
	West Walke River
Yuba	Bullards Bar Reservoir
	Englebright Reservoir
	Kanaka Creek

Recreation User Days

Of the sampled areas 67% of Sierra watersheds had stretches (16 of 24) affected by reductions in recreation user days due to closures, spills or other concerns.

Of the sampled areas 67% of Sierra watersheds had stretches (16 of 24) affected by reductions in recreation user days due to closures, spills or other concerns.

Recreation user days are those days that rivers, lakes and reservoirs are open and available for recreation, such as swimming, boating, fishing, etc. Reductions in recreation user days can occur when a toxic spill or other event results in contamination of water by chemical or biological constituents.

Reductions in recreation user days from beach closures or other warnings indicate potential impacts on water quality, habitat and other resources and can indicate potential harm to humans due to public health issues arising from *direct contact*, such as swimming, or *indirect contact*, such as boating, fishing or other water-based recreation.

Table 4.4 Sampled Watersheds with Stretches Affected by Reductions in Recreation User Days

WATERSHED	SPECIFIC WATEBODY
American	Folsom Reservoir
Carson	Indian Creek
Feather	Feather River, Middle Fork
	Feather River, North Fork
	Feather River, North Fork – East Branch
	Feather River, South Fork
Honey Lake	Honey Lake
Kaweah	Kaweah Lake
	Kaweah River, Lower
Kings	Kings River, South Fork/10 Mile Creek
	Pine Flat Reservoir
Merced	McClure Reservoir
	Merced River, Upper
Mojave	Mojave River, West Fork
Mono Basin	June Lake
Owens	Hot Creek

Table 4.4 Continued From Previous Page

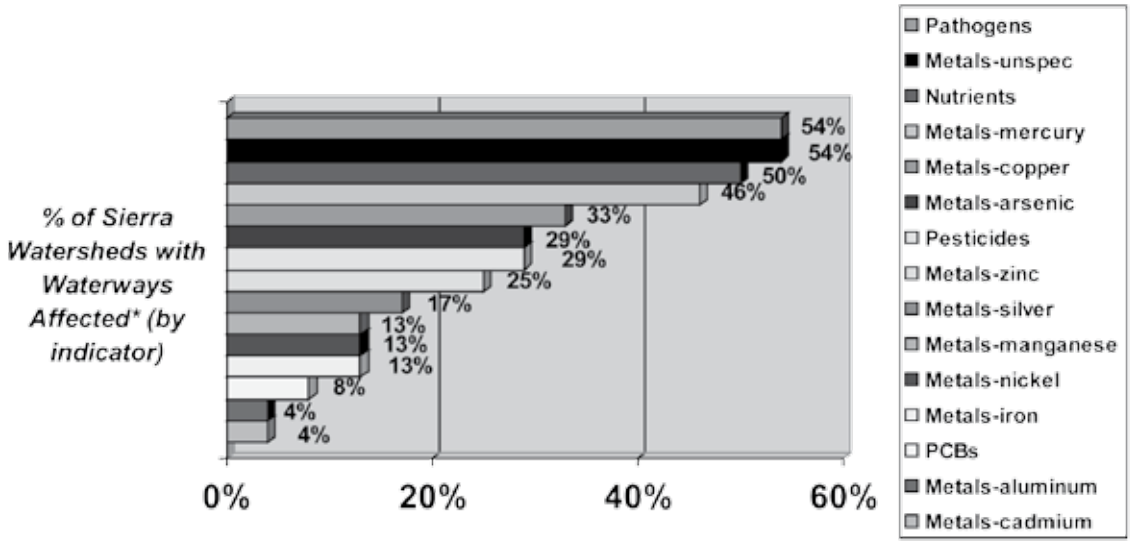
WATERSHED CONT.	SPECIFIC WATEBODY CONT.
Owens Cont.	Owens Lake
	Pleasant Valley Reservoir
	Tuttle Creek
	Tinemaha Reservoir
Sac Upper	Upper Sacramento River, above Shasta
San Joaquin	Willow Creek
Truckee	Blackwood Creek
	Bronco Creek
	Donner Lake
	Gray Creek
	Heavenly Valley Creek
	Lake Tahoe
	Little Truckee River
	Squaw Creek
	Truckee River, NV
	Ward Creek
Tule	Success Lake
Walker	Aurora Canyon Creek
	Bridgeport Reservoir
	Clark Canyon Creek
	Clearwater Creek
	East Walker River, above Bridgeport
	East Walker River, below Bridgeport
	Green Creek
	Hot Springs Canyon Creek
	Robinson Creek
	Rough Creek
	Topaz Lake
	West Walker River
Yuba	Bullards Bar Reservoir
	Englebright Reservoir
	Humbug Creek
	Rollins Reservoir
	Yuba River, South Fork above Edwards
	Yuba River, South Fork below Edwards
	Wolf Creek

* For more information on data analysis for Human Exposure Indicators please see Chapter 5.

INTRODUCED & NATURALLY OCCURRING CHEMICALS

Introduced and naturally occurring chemical indicators (e.g. trace inorganic, organic chemicals and nutrient concentrations) measure key chemical elements – such as metals (copper, zinc, lead, mercury and others), oils, pesticides, and nutrients (nitrogen and phosphorous) – that find their way into water bodies from sources such as vehicles, paved roads, parking lots, etc. Such information can be helpful in determining potential causes and sources of pollution or water quality impairment in our watersheds.

* *Affected* represents both those stretches that may truly be impacted negatively by an introduced substance and those that are found to have traces of a naturally occurring indicator. Please see the following individual write-ups on each indicator.



Pathogens – microorganisms that can cause disease in other organisms or in humans, animals and plants.

Metals – naturally occurring elements in the Earth's crust that are found in rocks, soils, water and air.

Nutrients – substances that are taken in or assimilated by organisms to promote maintenance or growth.

Pesticides – poisons designed to kill pests such as weeds, insects, birds, rodents, algae, and fungus.

PCBs – mixture of synthetic, toxic industrial chemicals once used in making paint and electrical transformers, which are chemically inert and not biodegradable.

INTRODUCED & NATURALLY OCCURING CHEMICAL INDICATOR DATA SOURCES

US Environmental Protection Agency (US EPA) – Watershed Assessment Tracking & Environmental Results

The US EPA, under its WATERS program (Watershed Assessment Tracking & Environmental Results), makes extensive water quality assessment information available through its 2002 National Water Quality Assessment Database.[30] Each state is required to report water quality information to the EPA, which the EPA then posts on its website in an interactive database. The State Water Resources Control Board is the agency in California responsible for reporting to the US EPA under this program, and the Nevada Division of Environmental Protection is the responsible agency in Nevada. The database includes both summary data by major watershed and more detailed information on the tributaries, lakes, wetlands and other water bodies within each watershed.

The assessment data is based on water quality standards adopted by each state or jurisdiction and then approved by the EPA for compliance with the federal Clean Water Act. Water quality standards have three elements: (1) designated uses, such as swimming, drinking, aquatic habitat, etc.; (2) criteria or thresholds to protect humans and fish from exposure to levels of pollution that could cause adverse effects; and (3) anti-degradation policies intended to prevent waters in the state from deteriorating from their current condition.

Once the state standards are set and approved, each state must then assess its waters to determine whether the standards are being met. Such assessments typically include introduced and naturally occurring chemicals, physical chemistry, and hydrology/geomorphology measures, including human exposures and other elements. So far in California, approximately 16% of the total river miles, half of the lakes, ponds and reservoirs and 55% of the state's wetland areas have been assessed. The State of Nevada has assessed 2.3% of its rivers and streams, 38% of its lakes, ponds and reservoirs, and 36% of its wetland areas.

Data location: *305(b) Water Quality Assessment Reports – Assessed Waters of California by Watershed* **http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=CA#assessed_waters and http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=NV#total_assessed_waters**

California State Water Resources Control Board (SWRCB/RWQCBs)

The California State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs) have ongoing efforts to monitor and assess water quality, to prepare the Section 303(d) list, and to develop TMDLs. The US EPA approved California's most recent 303(d) list in July 2003.

Data location: *2002 CWA Section 303(d) List of Water Quality Limited Segments* (Lahontan Region 6) – approved by US EPA July 2003 **http://www.waterboards.ca.gov/tmdl/docs/2002reg6303dlist.pdf**

2002 CWA Section 303(d) List of Water Quality Limited Segments (Central Valley Region 5) **http://www.waterboards.ca.gov/tmdl/docs/2002reg5303dlist.pdf**

Nevada Division of Environmental Protection (NDEP) – Bureau of Water Quality Planning (BWQP)

The Bureau of Water Quality Planning (BWQP) is responsible for several water quality protection functions which include collecting and analyzing water data, developing standards for surface waters, publishing informational reports, providing water quality education and implementing programs to address surface water quality. Nevada's Section 303(d) List provides a comprehensive inventory of water bodies in the state impaired by all sources.

Data location: Nevada's 2004 303(d) List (Draft) – December 2004 **http://ndep.nv.gov/bwqp/303dlist.htm and http://ndep.nv.gov/bwqp/file/305b2004.pdf**

Individual County Health Departments

Data location: consult your local County Health Department for more specific information for your area.

INTRODUCED & NATURALLY OCCURING CHEMICAL INDICATORS

Pathogens

Of the sampled areas 54% of Sierra watersheds had stretches (13 of 24) that were contaminated by pathogens.

Of the sampled areas 54% of Sierra watersheds had stretches (13 of 24) that were contaminated by pathogens.

Pathogens are microorganisms that can cause disease in other organisms or in humans, animals and plants. Pathogens may be bacteria, viruses or parasites.

Fish and shellfish contaminated by pathogens, or the contaminated water itself, can cause serious illness. Pathogens can also encourage increased oxygen demand by microorganisms, which can affect oxygen levels in water.

Pathogens are typically found in sewage, in runoff from animal farms or rural areas populated with domestic and/or wild animals, and in water used for swimming.

Table 4.5 Sampled Watersheds with Stretches Contaminated by Pathogens

WATERSHED	SPECIFIC WATERBODY
Carson	Carson River, West Fork Indian Creek
Feather	Feather River, Middle Fork
Eagle Lake	Eagle Lake
Honey Lake	Skedaddle Creek
Kaweah	Kaweah River, Upper
Kings	Kings River, South Fork/10 Mile Creek Pine Flat Reservoir
Merced	Merced River, Upper
Sac Upper	Shasta Reservoir

Table 4.5 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
San Joaquin	Willow Creek Bass Lake
Truckee	Blackwood Creek Donner Lake Trout Creek
Tule	Success Lake Tule River
Walker	Bodie Creek East Walker River, above Bridgeport East Walker River, below Bridgeport Robinson Creek Swauger Creek
Yuba	Wolf Creek Yuba River, Middle Fork Yuba River, North Fork Yuba River, South Fork above Edwards Yuba River, South Fork below Edwards

Metals

Metals are naturally occurring elements in the Earth's crust that are found in rocks, soils, water and air.

The following tables indicate which watersheds in the Sierra are impacted by metals of different kinds, based primarily on data from the U.S. Environmental Protection Agency and the California Water Resources Control Board and its Regional Water Quality Control Boards.

Unspecified Metals

Of the sampled areas 54% of Sierra watersheds had stretches (13 of 24) of "unspecified" metals detected in addition to the specific metals listed below.

In some cases the State Water Board does not specify the particular metal for which an individual waterway is listed – it simply identifies the source as "metal – unspecified." The presence of metals, in general, can indicate public health problems because metals can be potential carcinogens and can cause harm to humans, fish, and other species.

Of the sampled areas 54% of Sierra watersheds had stretches (13 of 24) of "unspecified" metals detected in addition to the specific metals listed below.

Table 4.6 Sampled Watersheds with Stretches that Detected Unspecified Metals

WATERSHED	SPECIFIC WATERBODY
American	Folsom Reservoir
Carson	Aspen Creek
	Bryant Creek
	Carson River, Main, NV
	Carson River, West Fork
	Leviathan Creek
	Monitor Creek
Eagle Lake	Eagle Lake
Honey Lake	Honey Lake wetlands
Kaweah	Kaweah Lake
Merced, Upper	McClure Reservoir
Mono Basin	Mill Creek
	Mono Lake
Owens	Haiwee Reservoir
	Mammoth Creek
	Owens Lake
	Tinemaha Reservoir
Sac Upper	Upper Sacramento River, above Shasta
Stanislaus	Stanislaus River
Truckee	Boca Reservoir
	Donner Lake
	Heavenly Valley Creek
	Lake Tahoe
	Martis Creek
	Squaw Creek
	Stampede Reservoir
	Steamboat Creek, NV
Walker	Aurora Canyon Creek
	Bodie Creek
	Bridgeport Reservoir
	Clearwater Creek
	East Walker River, below Bridgeport
	Topaz Lake
	West Walker River
	West Walker River, Nevada
Yuba	Bear River, Lower
	Humbug Creek
	Kanaka Creek

Mercury

Of the sampled areas 11 of the 24 major watersheds in the Sierra had stretches (46%) that detected mercury.

Of the sampled areas 54% of Sierra watersheds had stretches (13 of 24) of "unspecified" metals detected in addition to the specific metals listed below.

Small amounts of *mercury* occur naturally in the Sierra, but extensive gold mining in the region brought in much larger quantities of the toxic element. Gold miners used more than 26 million pounds of mercury in the Sierra to extract gold. As many as 8 million pounds may have escaped into watersheds through hydraulic mining and other mining processes, and some of this now remains in the gravel of streambeds, the sediments trapped behind dams, and the aquatic food chain.

Mercury reacts with bacteria to become methylmercury, a highly toxic compound that affects both humans and wildlife. Mercury exposure can affect the immune, reproductive, renal, and cardiovascular systems. Because it is a developmental toxin, it is particularly hazardous for children and pregnant women. Swimming in rivers or lakes or drinking tap water does not expose people to mercury, but eating contaminated fish is a major source of exposure.

Methylmercury becomes concentrated in fish through *bioaccumulation* – the retention and concentration of a substance by an organism – as it goes up the food chain. So as one organism eats another organism with mercury in it, that mercury accumulates and concentrates in the successive organisms. In top predators like bass, mercury concentrations can be 10,000 to 100,000 times higher than what is found in the environment.[31]

Table 4.7 Sampled Watersheds with Stretches that Detected Traces of Mercury

WATERSHED	SPECIFIC WATERBODY
American	American River, Lower
Carson, NV	Carson River, Main, NV
Eagle Lake	Eagle Lake
Honey Lake	Susan River
Merced, Upper	McClure Reservoir Merced River, Upper
Mono Basin	June Lake
Owens	Crowley Lake
Truckee	Lake Tahoe Steamboat Creek, NV
Tuolumne	Don Pedro Reservoir Dunn Creek
Yuba	Bear River, Upper Camp Far West Reservoir Combie Reservoir Englebright Reservoir Humbug Creek Little Deer Creek

Table 4.7 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY
Yuba Cont.	Rolllins Reservoir
	Scotts Flat Reservoir
	Yuba River, Middle Fork
	Yuba River, North Fork
	Yuba River, South Fork below Edwards
Walker	Aurora Canyon Creek

Copper

Of the sampled areas 33% of the watersheds in the Sierra had stretches (8 of 24) that detected traces of copper.

Copper is a metal that occurs naturally in rocks, soil, water and air. Low levels of copper are essential for maintaining good health in plants and animals (including humans). However, high levels can be harmful.

Of the sampled areas 33% of the watersheds in the Sierra had stretches (8 of 24) that detected traces of copper.

Ingesting high levels of copper can cause nausea, vomiting, and diarrhea in humans. Very high doses of copper can cause damage to your liver and kidneys, and can even cause death.

Lakes and rivers that have been treated with copper compounds to control algae, or that receive cooling water from power plants, can have high levels of copper. Copper is released into the environment through wastewater from activities such as mining, farming and manufacturing. It also comes from natural sources, including volcanoes, windblown dusts, decaying vegetation and forest fires. Copper attaches to particles of organic matter, clay, soil or sand, and does not break down. Copper compounds can break down and release free copper into the air, water and foods.

Table 4.8 Sampled Watersheds with Stretches that Detected Traces of Copper

WATERSHED	SPECIFIC WATERBODY
Carson, NV	Bryant Creek, NV
Feather	Feather River, North Fork – East Branch
Kaweah	Kaweah Lake
Mokelumne	Mokelumne River, Lower
Owens	Haiwee Reservoir
	Tinemaha Reservoir
Sac Upper	Shasta Reservoir
Walker	West Walker River
Yuba	Humbug Creek

Arsenic

Of the sampled areas 7 of 24 watersheds in the Sierra had stretches (29%) that detected traces of arsenic.

Of the sampled areas 7 of 24 watersheds in the Sierra had stretches (29%) that detected traces of arsenic.

Arsenic is a naturally occurring element widely distributed in the Earth's crust.

Ingesting high levels of inorganic arsenic can be toxic. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Arsenic in water is largely the result of minerals dissolving naturally from weathered rocks and soils. Mining and other activities can accelerate the process, causing arsenic to enter rivers through runoff or leaching from stockpiles of ore and mine tailings.

Table 4.9 Sampled Watersheds with Stretches that Detected Traces of Arsenic

WATERSHED	SPECIFIC WATERBODY
Carson, NV	Bryant Creek, NV
Honey Lake	Honey Lake
Kaweah	Kaweah Lake
Owens	Crowley Lake Hot Creek Owens Lake Owens River
Truckee, NV	Steamboat Creek, NV
Walker	Topaz Lake West Walker River
Yuba	Kanaka Creek

Zinc

Of the sampled areas 25% of the watersheds in the Sierra had stretches (6 of 24) that detected traces of zinc.

Of the sampled areas 25% of the watersheds in the Sierra had stretches (6 of 24) that detected

Zinc is one of the most common elements in the earth's crust. The bluish-white shiny metal is found in air, soil, and water, and is present in all foods. Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys like brass, and bronze. Zinc combines with other elements to form zinc compounds. Common zinc compounds found at hazardous waste sites include zinc chloride, zinc oxide, zinc sulfate, and zinc sulfide. Zinc compounds are widely used in industry to make paint, rubber, dyes, wood preservatives, and ointments.

Harmful effects generally begin at levels 10-15 times higher than the amount needed for good health. Large doses taken by mouth even for a short time can cause stomach cramps, nausea, and vomiting. Taken longer, it can cause anemia and decrease the levels of good cholesterol in the bloodstream. Inhaling large amounts of zinc (as dusts or fumes) can cause a specific short-term disease called metal fume fever.

Some zinc is released into the environment by natural processes; but most comes from human activities like mining, steel production, coal burning, and burning of waste. When zinc enters the environment it attaches to soil, sediments, and dust particles in the air. Rain and snow can remove zinc dust particles from the air and deposit them in soil. Depending on the type of soil, some zinc compounds can then move into the groundwater and into lakes, streams, and rivers where people are exposed from drinking water contaminated with zinc.

Table 4.10 Sampled Watersheds with Stretches that Detected Traces of Zinc

WATERSHED	SPECIFIC WATERBODY
Carson	Carson River, East Fork
Feather	Feather River, North Fork – East Branch
Mokelumne	Mokelumne River, Lower
Sac Upper	Shasta Reservoir
Truckee	Truckee River
Yuba	Humbug Creek

Silver

Of the sampled areas (4 of 24) of the major watersheds in the Sierra had stretches that detected traces of silver.

Silver is a naturally occurring element, found in the environment combined with other elements such as sulfide, chloride, and nitrate. Silver is often found as a by-product during the retrieval of copper, lead, zinc, and gold ores.

Of the sampled areas (4 of 24) of the major watersheds in the Sierra had stretches that detected traces of silver.

Exposure – through breathing low levels in the air or swallowing it in food or drinking water – to high levels of silver for a long period of time may result in a condition called argyria, a blue-gray discoloration of the skin and other body tissues. Lower-level exposures to silver may also cause silver to be deposited in the skin and other parts of the body; however, this is not known to be harmful. Argyria is a permanent effect, but it appears to be a cosmetic problem that may not be otherwise harmful to health.

Exposure to high levels of silver in the air has resulted in breathing problems, lung and throat irritation, and stomach pains. Skin contact with silver can cause mild allergic reactions such as rash, swelling, and inflammation in some people.

Silver may be released into the air and water through natural processes such as the weathering of

rocks. Human activities such as the processing of ores, cement manufacture, and the burning of fossil fuel may also release silver into the air. Silver does not appear to concentrate to a significant extent in aquatic animals.

Table 4.11 Sampled Watersheds with Stretches that Detected Traces of Silver

WATERSHED	SPECIFIC WATERBODY
Carson	Carson River, East Fork Monitor Creek
Kaweah	Kaweah Lake
Truckee	Truckee River
Walker	East Walker River, below Bridgeport

Manganese

Of the sampled areas 13% of the watersheds in the Sierra had stretches (3 of 24) that detected traces of manganese.

Of the sampled areas 13% of the watersheds in the Sierra had stretches (3 of 24) that detected traces of manganese.

Manganese is a trace element found in many types of rocks.

Small amounts of manganese from food or water is needed to stay healthy; but exposure to excessive levels may occur from breathing air, particularly where manganese is used in manufacturing, and from drinking water and eating food with excessive manganese in it. At high levels, manganese can cause damage to the brain, liver, kidneys, and the developing fetus.

Manganese exists naturally in rivers, lakes and underground water. Plants growing in the water can take up and concentrate manganese in their cells.

Table 4.12 Sampled Watersheds with Stretches that Detected Traces of Manganese

WATERSHED	SPECIFIC WATERBODY
American	American River, Lower
Carson	Monitor Creek
Walker	Topaz Lake West Walker River

Nickel

Of the sampled areas 13% (3 of 24) of the major watersheds in the Sierra had stretches that detected traces of nickel.

Of the sampled areas 13% (3 of 24) of the major watersheds in the Sierra had stretches that detected traces of nickel.

Nickel is an abundant natural element found in all soil and is emitted from volcanic explosions. Eating or drinking large amounts of nickel has caused lung disease in dogs and rats. The most common harmful health effect of nickel in humans is an allergic reaction.

Nickel can combine with other elements, such as chlorine, sulfur or oxygen, to form nickel compounds. These compounds dissolve fairly easily in water. Nickel also attaches to particles that contain iron or manganese, making it a constituent of watershed soils and sediments.

Table 4.13 Sampled Watersheds with Stretches that Detected Traces of Nickel

WATERSHED	SPECIFIC WATERBODY
Carson, NV	Bryant Creek, NV
Honey Lake	Susan River
Walker	East Walker River, above Bridgeport

Iron

Of the sampled area 13% (3 of 24) of the major watersheds in the Sierra had stretches that detected traces of iron.

Of the sampled area 13% (3 of 24) of the major watersheds in the Sierra had stretches that detected traces of iron.

Iron is one of the more common elements on Earth, making up about 5% of the Earth's crust.

Iron in high concentrations can be toxic to aquatic organisms. Too much iron can also affect humans, especially when it accumulates in vital organs (the heart, pancreas, and liver).

It is often found in groundwater in *soluble* or dissolved form or as suspended particles.

Table 4.14 Sampled Watersheds with Stretches that Detected Traces of Iron

WATERSHED	SPECIFIC WATERBODY
Carson	Bryant Creek, NV
	Carson River, East Fork
	Carson River, Main, NV
	Carson River, West Fork
	Monitor Creek
Truckee	Blackwood Creek
	General Creek
	Lake Tahoe
	Steamboat Creek, NV
	Trout Creek
	Truckee River
	Ward Creek
Walker, NV	Walker River, NV
	East Walker River, NV
	West Walker River, NV

Aluminum

Of the sampled areas only one watershed in the Sierra has stretches that detected traces of aluminum.

Aluminum is a naturally occurring element that makes up about 8% of the surface of the Earth.

Of the sampled areas only one watershed in the Sierra has stretches that detected traces of aluminum.

Low-level exposure to aluminum from food, air, water, or contact with skin is not thought to harm your health. Aluminum, however, is not a necessary substance for our bodies, and too much may be harmful. Some infants and adults who received large doses of aluminum as a treatment for other health problems have developed bone diseases, suggesting that aluminum may cause skeletal problems. Large amounts of aluminum have been shown to be harmful to unborn and developing animals, causing delays in skeletal and neurological development. Aluminum has also been shown to cause lower birth weights in some animals.

Aluminum gets into the watershed by dissolving in lakes, streams, and rivers, depending on the quality of the water; and it can be taken up into some plants from the soil, as well.

Table 4.15 Sampled Watersheds with Stretches that Detected Traces of Aluminum

WATERSHED	SPECIFIC WATERBODY
Carson	Carson River, East Fork
	Monitor Creek

Cadmium

Of the sampled areas only one watershed in the Sierra had a waterway that detected traces of cadmium – the Upper Sacramento.

Cadmium is a natural element in the Earth's crust. All soils and rocks, including coal and mineral fertilizers, contain some cadmium.

Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea. Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects can include lung damage and fragile bones.

Cadmium enters water and soil from waste disposal and spills or leaks at hazardous waste sites. Cadmium binds strongly to soil particles, and under certain conditions some cadmium dissolves in water. Fish, plants, and animals take up cadmium from the environment.

Of the sampled areas only one watershed in the Sierra had a waterway that detected traces of cadmium – the Upper Sacramento.

The one watershed with stretches that detected traces of Cadmium was the Upper Sacramento Watershed and specifically the Shasta Reservoir.

Nutrients

Of the sampled areas 50% of Sierra watersheds had stretches (12 of 24) that are affected by excess nutrient levels.

A *nutrient* is any substance that is taken in or assimilated by organisms to promote maintenance or growth. For example, carbon dioxide, nitrogen, phosphorous, potassium and numerous mineral elements are essential nutrients to promote growth. Water and oxygen can also be included in this definition.

However, certain mineral compounds can have an adverse effect on water quality because of their ability to promote excessive plant and algae growth. An excessive growth of aquatic plants can clog waterways, and over-stimulation of algae and microbes ultimately leads to an ecological process called *eutrophication*, where the increase in available nutrients promotes plant growth, favoring certain species over others and forcing a change in overall species composition. Excess nutrients can harm aquatic organisms by increasing algae growth, which blocks sunlight and can kill plants and decrease oxygen content of the water.

Of the sampled areas 50% of Sierra watersheds had stretches (12 of 24) that are affected by excess nutrient levels.

Table 4.16 Sampled Watersheds with Stretches Affected by Excess Nutrient Levels

WATERSHED	SPECIFIC WATERBODY
Carson	Carson River, East Fork
	Carson River, Main, NV
	Carson River, West Fork
	Indian Creek
	Indian Creek Reservoir
Eagle Lake	Eagle Lake
Honey Lake	Susan River
Kaweah	Kaweah River, Upper
Kings	Kings River, South Fork/10 Mile Creek
Mojave	Mojave River, West Fork
Mono Basin	June Lake
	Mill Creek
	Mono Lake
Owens	Crowley Lake
	Haiwee Reservoir
	Mammoth Creek
	Pleasant Valley Reservoir
	Tinemaha Reservoir
	Twin Lakes
San Joaquin	Bass Lake
Truckee	Blackwood Creek
	Cinder Cone Springs
	Donner Lake
	General Creek
	Heavenly Valley Creek
	Lake Tahoe

Table 4.16 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
Truckee Cont.	Martis Creek Squaw Creek Steamboat Creek, NV Trout Creek Truckee River Truckee River, NV Ward Creek
Tule	Success Lake Tule River
Walker	Aurora Canyon Creek Bridgeport Reservoir East Walker River, below Bridgeport East Walker River, NV Green Creek Robinson Creek Swauger Creek West Walker River West Walker River, NV

Pesticides

Of the sampled areas 29% of Sierra watersheds (7 of 24) had stretches that are affected by pesticides.

Of the sampled areas 29% of Sierra watersheds (7 of 24) had stretches that are affected by pesticides.

Pesticides are poisons designed to kill pests such as weeds, insects, birds, rodents, algae, and fungus. Pesticides are used in agriculture, homes, lawns, gardens, parks, workplaces, businesses, schools, lakes and other settings.

Many pesticides are recognized by California and federal regulatory agencies as being acutely toxic, known or probable carcinogens, reproductive or developmental toxicants, and known groundwater contaminants. Pesticides also can affect many members of an ecosystem – from the smallest invertebrate to fish, birds, humans and other mammals. Pesticides can reduce species diversity in the animal kingdom and contribute to population declines in animals and plants by destroying habitat, reducing food supplies, and impairing reproduction.

The insecticide diazinon, listed as a pollutant in several Sierra rivers and streams, is a frequently used, acutely toxic pesticide that dissolves easily in water. Diazinon is an organophosphate. Organophosphate was designed as nerve gas for war in the first part of the 20th century and was later adapted to kill insects and other pests. Organophosphates interfere with human, mammal and insect acetylcholine at neural connections that can cause a range of symptoms including dizziness, nausea and even death.

Diazinon is also "very highly toxic to fish" even at very low levels, according to the US EPA.

Diazinon can accumulate in the flesh or tissue of fish in concentrations up to 200 times higher than those in the water where the fish live. Unfortunately diazinon frequently contaminates water because it can last for a long time moves easily in soil, making run-off into surface water likely.

Group A pesticides (noted in Table 4.17) are known as *persistent organochlorine pesticides*. These compounds also last a long time in the environment and tend to accumulate in sediments, plants and animals. Organochlorines can cause a wide range of both acute and chronic health effects in humans, including cancer, neurological damage, and birth defects. Many organochlorines are also suspected endocrine disruptors – meaning they interfere with hormones. Endocrine disruption can result in abnormalities such as frogs with no legs or frogs that exhibit characteristics of both sexes. Organochlorines, with their ability to persist over long periods of time and *bioaccumulate* up the food chain (in other words, pass on from one organism to another as a predator eats contaminated prey), are especially harmful. Perhaps the most notorious organochlorine was DDT, which has been outlawed in the United States for many years.

Table 4.17 **Sampled Watersheds with Stretches Affected by Pesticides**

WATERSHED	SPECIFIC WATERBODY
Feather	Feather River, Middle Fork
	Feather River, North Fork – East Branch
	Feather River, South Fork
Mokelumne	Mokelumne River, Upper – priority organic
Owens	Haiwee Reservoir – unspecified algaecide
Stanislaus	Stanislaus River – Group A pesticides, diazinon
Truckee	Donner Lake – not specified
	General Creek
	Lake Tahoe – not specified
	Squaw Creek
	Stampede Reservoir – not specified
Tuolumne	Tuolumne River – Group A pesticides, diazinon
Yuba	Bear River, Lower – diazinon

NOTE: Group A Pesticides (or Chem A) include: aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, hexachlorocyclohexane (including lindane), endosulfan, and toxaphene

PCBs

Of the sampled areas 8% of Sierra watersheds had stretches (2 of 24) that are affected by PCB contamination.

Of the sampled areas 8% of Sierra watersheds had stretches (2 of 24) that are affected by PCB contamination.

Polychlorinated biphenyls (PCBs) are a mixture of synthetic, toxic industrial chemicals once used in making paint and electrical transformers, which are chemically *inert*, meaning they don't react with other substances, and are not biodegradable. Although they

are no longer produced in the United States, they are still found in industrial wastes and surface and ground waters from prior use.

PCBs can cause harm to humans, fish and other species, and they present a potential public health concern related to eating fish with high concentrations of PCBs. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children.

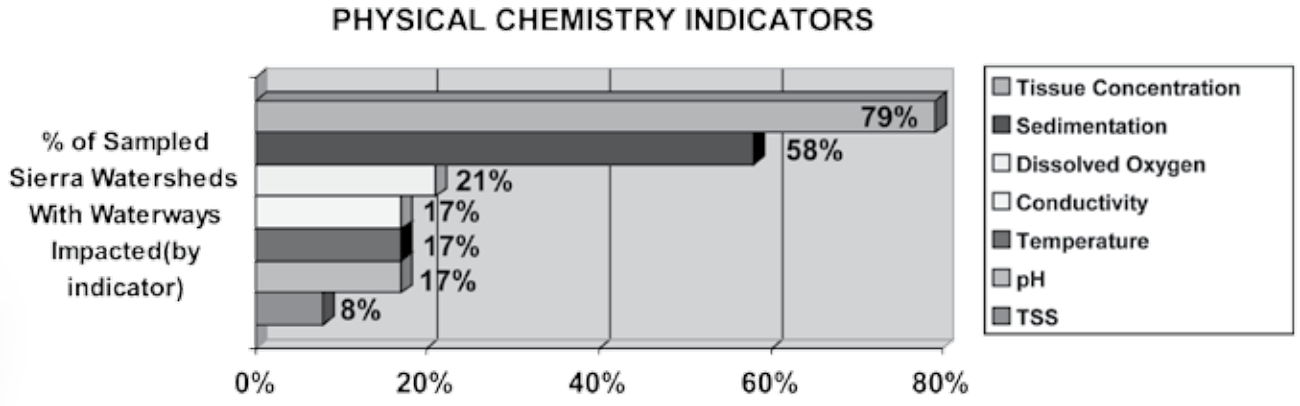
In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil. Small organisms and fish in water take up PCBs. Other animals that eat these aquatic animals as food also take them up. PCBs accumulate in the tissue of fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

Table 4.18 **Sampled Watersheds with Stretches Affected by PCBs**

WATERSHED	SPECIFIC WATERBODY
American	American River, Lower
Truckee	Donner Lake

PHYSICAL CHEMISTRY

Physical Chemistry indicators measure characteristics of the water that can affect organisms that live in the water (ie: fish, insects and algae), such as temperature (which can affect reproduction), the amount of dissolved oxygen in the water (which affects respiration), sedimentation (affecting fish spawning), and other elements.



Tissue Concentration – contaminants that collect and concentrate in the tissue or flesh of fish at levels that are greater than the level of the contaminant in the surrounding water.

Sedimentation – solid particles of soil or other substances (called suspended solids), carried in moving water, which are deposited in the stream bottom when the moving water slows down (as in an eddy or a pool or behind a dam).

Dissolved Oxygen –the amount of oxygen dissolved in water, necessary for aquatic organisms to survive.

Conductivity – the ability of water to conduct heat or an electrical current.

Temperature – the relative degree of heat or cold in the water that can affect how aquatic plants and animals live and breed.

pH – a measure of the relative acidity or alkalinity of water – water with a pH of 7 is neutral; lower pH levels indicate increasing acidity, while pH levels higher than 7 indicate increasingly basic solutions.

Total Suspended Solids (TSS) – solid particles, such as soil particles, that either float on the surface of the water or are suspended in water.

PHYSICAL CHEMISTRY INDICATOR DATA SOURCES

US Environmental Protection Agency (US EPA) – Water Quality Assessment Reports

Data location: *305(b) Water Quality Assessment Reports – Assessed Waters of California by Watershed* **http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=CA#assessed_waters and http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=NV#total_assessed_waters**

California State Water Resources Control Board (SWRCB/RWQCBs)

Data location: *2002 CWA Section 303(d) List of Water Quality Limited Segments* (Lahontan Region 6) – approved by US EPA July 2003 **http://www.waterboards.ca.gov/tmdl/docs/2002reg6303dlist.pdf**

2002 CWA Section 303(d) List of Water Quality Limited Segments (Central Valley Region 5) **http://www.waterboards.ca.gov/tmdl/docs/2002reg5303dlist.pdf**

Nevada Division of Environmental Protection (NDEP) – Bureau of Water Quality Planning (BWQP)

Data location: *Nevada's 2004 303(d) List (Draft)* – December 2004 **http://ndep.nv.gov/bwqp/303dlist.htm**

PHYSICAL CHEMISTRY INDICATORS

Tissue Concentration

Of the sampled areas 79% of Sierra watersheds had stretches (19 of 24) that are affected by high concentrations of certain contaminants in the tissue of fish, which can, in turn, be harmful to humans if eaten.

Tissue concentration refers to contaminants that collect and concentrate in the tissue or flesh of fish at levels that are greater than the level of the contaminant in the water itself.

High tissue concentrations of selected contaminants are a potential public health issue because, depending on the element, they can cause human health impacts through direct consumption of contaminated fish flesh.

Of the sampled areas 79% of Sierra watersheds had stretches (19 of 24) that are affected by high concentrations of certain contaminants in the tissue of fish, which can, in turn, be harmful to humans if eaten.

Table 4.19 Sampled Watersheds with Stretches Affected by High Concentration of Tissue Concentration

WATERSHED	SPECIFIC WATERBODY
American	American River, Lower
	Folsom Reservoir
Carson	Carson River, East Fork
	Carson River, Main, NV
	Carson River, West Fork
Feather	Feather River, Middle Fork
	Feather River, North Fork
	Feather River, North Fork – East Branch
	Feather River, South Fork
Eagle Lake	Eagle Lake
Honey Lake	Susan River
Kaweah	Kaweah River, Lower
Kern	Isabella Reservoir
	Kern River, Lower
Kings	Pine Flat Reservoir
Merced	McClure Reservoir
Mokelumne	Mokelumne River, Upper
Mono Basin	June Lake
	Mill Creek
Owens	Crowley Lake
	Haiwee Reservoir
	Hot Creek
	Mammoth Creek
	Tinemaha Reservoir
	Tuttle Creek

Table 4.19 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
Sac Upper	Upper Sacramento River, above Shasta
Stanislaus	Stanislaus River
Truckee	Boca Reservoir Donner Lake Lake Tahoe Little Truckee River Squaw Creek Stampede Reservoir Truckee River
Tule	Tule River
Tuolumne	Don Pedro Reservoir Dunn Creek Tuolumne River
Walker	Aurora Canyon Creek Bodie Creek East Walker River, above Bridgeport East Walker River, below Bridgeportk Green Creek
Yuba	Bear River, Lower Bear River, Upper Bullards Bar Reservoir Camp Far West Reservoir Combie Reservoir Englebright Reservoir Little Deer Creek Rollins Reservoir Scotts Flat Reservoir Yuba River, South Fork above Edwards

Sedimentation

Of the sampled areas 58% of Sierra watersheds had stretches (14 of 24) that are affected by excess sedimentation.

Of the sampled areas 58% of Sierra watersheds had stretches (14 of 24) that are affected by excess sedimentation.

Sedimentation occurs when solid particles of soil or other substances (called *suspended solids*) collect in the bottom of a stream or riverbed. Typically sediment is carried in moving water; but when the water stops moving, such as when it hits a pool after a rapid or gets caught in an eddy or behind a dam, the solid particles settle out or fall to the bottom of the stream. At that point suspended solids become sediment.

Sediment is a natural part of a stream system. However, an excess level of sediment greater than is

naturally occurring can create problems. As sediment particles settle out of suspension and drop to the stream bottom, they can clog fish gills, increase water temperature, block sunlight needed for photosynthesis and smother fish eggs and *benthic* or bottom-dwelling organisms. Excess sediment can also affect drinking water by clogging intake valves, filters and other workings of water treatment plants. Excess sediment can also reduce the ability of dams and reservoirs to store water and/or generate electricity.

Natural sources of sediment include leaves and other plant materials and decayed plant and animal matter that decomposes into smaller particles in the river. Sources of sediment from human activity include industrial discharges, sewage, fertilizers, road runoff, and soil erosion. Sediment measurements can help determine the effects of runoff from construction, agricultural practices, logging, existing housing development, sewage treatment plant discharges and other sources.

Concentrations often increase sharply during rainfall and when earth-disturbing activities are occurring in or near the stream without erosion control practices in place. Concentrations from human activities also depend on existing vegetation cover, precipitation, slope steepness, and soil type. Dams and diversions can dramatically modify the sediment concentrations due to large gravels settling in reservoirs. Fine silts remain in the water column, to wind up below the dams, destroying habitat but not replenishing gravels. Sediment levels are closely related to stream flow and velocity and should be correlated with these factors. [32]

Table 4.20 **Sampled Watersheds with Stretches Affected by Excess Sedimentation**

WATERSHED	SPECIFIC WATERBODY
American	Folsom Reservoir
Carson	Bryant Creek, NV Carson River, East Fork Carson River, Main, NV Carson River, West Fork Wolf Creek
Eagle Lake	Pine Creek
Feather	Feather River, Middle Fork Feather River, North Fork – East Branch
Honey Lake	Honey Lake Susan River
Kaweah	Kaweah Lake
Kern	Isabella Reservoir
Merced	Merced River, Upper
Mono Basin	June Lake Lee Vining Creek Mono Lake
Owens	Goodale Creek Mammoth Creek

Table 4.20 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
Owens Cont.	Owens River
	Pleasant Valley Reservoir
Truckee	Blackwood Creek
	Bronco Creek
	Donner Lake
	Gray Creek
	Heavenly Valley Creek
	Lake Tahoe
	Little Truckee River
	Martis Creek
	Squaw Creek
	Trout Creek
	Truckee River
	Ward Creek
Tule	Success Lake
Walker	Aurora Canyon Creek
	Bodie Creek
	Bridgeport Reservoir
	Clark Canyon Creek
	Clearwater Creek
	East Walker River, below Bridgeport
	Hot Springs Canyon Creek
	Robinson Creek
	Rough Creek
	Topaz Lake
	West Walker River
Yuba	Bullards Bar Reservoir
	Camp Far West Reservoir
	Combie Reservoir
	Englebright Reservoir
	Humbug Creek

Dissolved Oxygen

Of the sampled areas 21% of Sierra watersheds had stretches (5 of 24) that are impacted by abnormal levels of dissolved oxygen (DO).

Of the sampled areas 21% of Sierra watersheds had stretches (5 of 24) that are impacted by abnormal levels of dissolved oxygen (DO).

Dissolved Oxygen (DO) is literally the amount of oxygen dissolved in water, as measured in micrograms per liter (mg/L) or parts per million (ppm). Most aquatic organisms need dissolved oxygen in the water to survive and grow. Some species, such as trout and stoneflies, require

high levels of DO, while other species, such as catfish and worms, require less.

Insufficient dissolved oxygen can result in death of adult and juvenile organisms, reduction in growth, failure of fish eggs/insect larvae to survive, change in mix or numbers of species present, growth of toxic or smothering bacteria, fungi, or algae.

River systems both produce and consume oxygen. A system gains oxygen from the atmosphere and from plants as a result of photosynthesis. Running water, because of its churning action, dissolves more oxygen than still water does, so there is typically more dissolved oxygen in fast-moving water than in lakes or the reservoir behind a dam.[33]

Dissolved oxygen levels can change based on temperature (as water temperature increases, less oxygen can be dissolved in water) or presence of other elements. For example, if organic material like algae or waste materials from a septic leak are present in water, bacteria quickly move in to decay that material. As the bacteria breathe and feed on the decaying material, they use up the oxygen and expel CO^2 into the water. Large algae blooms (which can be caused by events such as the dumping of lawn clippings or leaves into the water, or fertilizer runoff) can result in near-zero oxygen conditions in creeks, streams or rivers.

Table 4.21 Sampled Watersheds with Stretches Affected by Abnormal levels of Dissolved Oxygen

WATERSHED	SPECIFIC WATERBODY
Carson	Carson River, East Fork
Eagle Lake	Eagle Lake
Mokelumne	Mokelumne River, Lower
Owens	Pleasant Valley Reservoir
Truckee	Lake Tahoe

Conductivity

Of the sampled area 17% of Sierra watersheds had stretches (4 of 24) that are affected by high conductivity levels.

Of the sampled area 17% of Sierra watersheds had stretches (4 of 24) that are affected by high conductivity levels.

Conductivity is the ability of water to conduct heat or an electrical current. Dissolved ions in the water serve as the conductors. The major positively charged ions are sodium (Na^+) calcium (Ca^{2+}), potassium (K^+) and magnesium (Mg^{2+}). The major negatively charged ions are chloride (Cl), sulfate (SO_4^{-2}), carbonate (CO_3^{-2}), and bicarbonate (HCO_3). Nitrates (NO_3^{2}) and phosphates (PO_4^{-3}) are minor contributors to conductivity, although they are very important ions biologically speaking.

Because dissolved ions increase salinity as well as conductivity, the two values are related when it comes to water quality. *Salinity* is a measure of the amount of salts or ions in the water. The salts in seawater are primarily sodium chloride (NaCI); however, other saline waters, such as Mono Lake, owe their high salinity to a combination of dissolved ions including sodium, chloride, carbonate and sulfate.

Conductivity will vary depending on the water source such as ground water versus water drained from agricultural fields. Therefore, conductivity can indicate groundwater seepage or a sewage leak.

As temperature increases, conductivity increases. Conductivity can affect the quality of water used for irrigation or drinking, as well as affecting different organisms living in the water. Most aquatic plants and animals tolerate a range of conductivity. However, the ionic composition of the water can be critical. For example, cladocerans (water fleas) are far more sensitive to potassium chloride than sodium chloride at the same concentration.

Ions get into the water through soil and rocks as waters flow through or over them. The geology of a certain area will, therefore, determine the amount and type of ions in the soil and water. De-icing salt used on roads and driveways can also end up in nearby streams and may affect salinity and, therefore, conductivity, until large volumes of low-salinity water dilute it. Fresh water lost through evaporation will also increase the conductivity and salinity of a waterbody.[34]

Table 4.22 Sampled Watersheds with Stretches Affected by Conductivity

WATERSHED	SPECIFIC WATERBODY
Carson	Monitor Creek
Honey Lake	Honey Lake
Kern	Kern River, Lower
Truckee	Cinder Cone Springs Heavenly Valley Creek

Temperature

Of the sampled areas 17% of Sierra watersheds had stretches (4 of 24) that are affected by extreme temperatures.

Temperature is the relative degree of heat or cold in the water.

Variations or extremes in temperature can cause potential harm to aquatic organisms, including fish and amphibians. Temperature affects the oxygen content of the water; rate of photosynthesis by aquatic plants; the metabolic rates of aquatic organisms; and the sensitivity of organisms to toxic wastes, parasites, and diseases.

Water temperature can be affected by a number of factors besides just the ambient temperature outside, such as the amount of shade provided by tree and foliage cover on the banks, amount of suspended solids in the water (suspended solids can either magnify the sun's energy or block sunlight), or degree of decaying material in the water.

Of the sampled areas 17% of Sierra watersheds had stretches (4 of 24) that are affected by extreme temperatures.

Table 4.23 Sampled Watersheds with Stretches Negatively Affected by Extreme Temperature

WATERSHED	SPECIFIC WATERBODY
Carson	Bryant Creek, NV
	Carson River, East Fork
	Carson River, Main, NV
	Carson River, West Fork
Feather	Feather River, Middle Fork
	Feather River, North Fork
	Feather River, North Fork – East Branch
Truckee	Truckee River, NV
Walker	East Walker River, NV

pH

Of the sampled areas 17% of Sierra watersheds had stretches (4 of 24) that are impacted by high or low pH.

Of the sampled areas 17% of Sierra watersheds had stretches (4 of 24) that are impacted by high or low pH.

pH is a measure of the relative acidity or alkalinity of water. Water with a pH of 7 is neutral; lower pH levels indicate increasing acidity, while pH levels higher than 7 indicate increasingly basic solutions or higher alkalinity. pH affects many chemical and biological processes in the water. For example, different organisms flourish within different ranges of pH.

The largest variety of aquatic animals prefers a range of 6.5-8.0. pH outside this range reduces the diversity in the stream because it stresses the physiological systems of most organisms and can reduce reproduction. Low pH can also allow toxic elements and compounds to become mobile and "available" for uptake by aquatic plants and animals. This can produce conditions that are toxic to aquatic life, particularly to sensitive species like rainbow trout. Changes in acidity can be caused by atmospheric deposition (acid rain), surrounding rock, and certain wastewater discharges.

pH can change because of external inputs, such as:

- changes in tree types surrounding the water, for example conifer needles are acidic and maple leaves are basic
- changes in adjacent soils or rock types and erosion events
- changes in the stream bottom material, for example the difference between gravel, silt, and bedrock
- large changes in temperature affecting the CO_2/O_2 (carbonic acid) cycle in the water.
- changes in human activity affecting the stream.

Other factors include:

- In fresh water, increasing temperature decreases pH.
- Waters with high algal growth can show a diurnal change in pH. When algae grow and reproduce they use carbon dioxide. This reduction causes the pH to increase. Therefore, if conditions are favorable for algal growth (sunlight, warm temperatures), the water will be more alkaline. Maximum pH usually occurs in late afternoon, pH will decline at night. Because algal growth is restricted to light penetrating zones, pH can vary with depth in lakes, estuaries, bays and ocean water.

Table 4.24 Sampled Watersheds with Stretches Affected by High or Low pH

WATERSHED	SPECIFIC WATERBODY
Honey Lake	Honey Lake
	Susan River
Mokelumne	Mokelumne River, Lower
Walker	East Walker River, below Bridgeport
	East Walker River, NV
	East Walker River, below Bridgeport
	East Walker River, NV
	West Walker River, NV
Yuba	Deer Creek

Total Suspended Solids (TSS)

Of the sampled areas 8% of Sierra watersheds had stretches (2 of 24) that are affected by high levels of total suspended solids.

Of the sampled areas 8% of Sierra watersheds had stretches (2 of 24) that are affected by high levels of total suspended solids.

Total Suspended Solids (TSS) are solid particles, such as soil particles, that either float on the surface of the water or are suspended in water.

Like sediment and siltation, which are suspended solids that have fallen to the lake or river bottom, high concentrations of suspended solids can make drinking water unpalatable and can cause sickness in humans. Suspended solids can also affect the efficiency of wastewater treatment plants and some industrial processes. Suspended solids also affect water clarity and slow photosynthesis by aquatic plants since more solids decrease the passage of light through water. Water filled with suspended solids also heats up more rapidly and holds more heat, affecting aquatic organisms that require lower temperatures for living and breeding.

Natural sources of suspended solids include leaves and other plant materials and decayed plant and animal matter that is converted into particulate matter within the river. Sources of suspended solids from human activity include industrial discharges, sewage, fertilizers, road runoff, and soil erosion. Suspended solid measurements can help determine the effects of runoff from construction,

agricultural practices, logging, existing housing development, sewage treatment plant discharges and other sources.

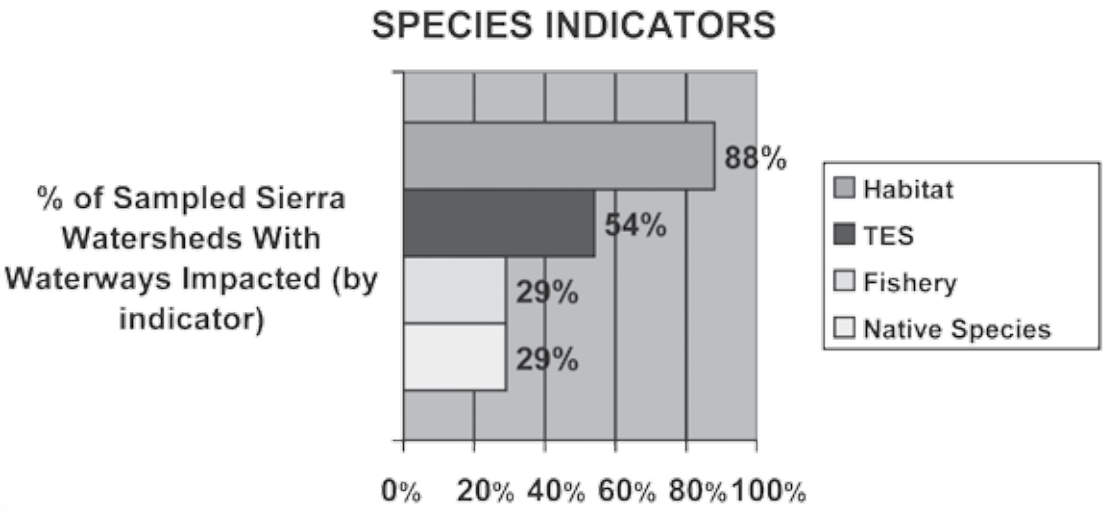
Concentrations often increase sharply during rainstorms and when earth-disturbing activities are occurring in or near the stream without erosion control practices in place. Concentrations from human activities also depend on existing vegetation cover, precipitation, slope steepness, and soil type. Suspended solid concentrations are closely related to stream flow and velocity and should be correlated with these factors.[35]

Table 4.25 Sampled Watersheds with Stretches Affected by High Levels of Total Suspended Solids

WATERSHED	SPECIFIC WATERBODY
Carson	Bryant Creek, NV Carson River, Main, NV
Walker	East Walker River, NV Walker River, NV

SPECIES

Species indicators measure presence/absence and condition of different key species, both native and non-native, as a gauge of relative health of the overall system.



Habitat – the physical and biological elements of ecosystems that support plant and animal livelihood.

TES (Threatened or Endangered Species) – extent of threatened or endangered species listed in a particular watershed is an indicator of relative risk of extinction of native species; endangered species are those in danger of extinction throughout all or a significant portion of their range; threatened species are those likely to become endangered in the foreseeable future.

Fishery – relative health and abundance of naturally reproducing or stocked populations of specific fish species.

Native Species – the degree of native species, meaning those that originate from a specific area, versus non-natives, or those that migrate or are introduced to an area from outside; non-natives may act as predators, parasites and competition for food and habitat; they may alter essential habitat, resulting in new aquatic communities that can cause imbalance in a previously stable system; and they may threaten human health and economic well-being by altering the ecosystem.

SPECIES INDICATOR DATA SOURCES

NOAA-National Marine Fisheries Service (NMFS)

The National Marine Fisheries Service's *Southwest Region*, located in Long Beach, California, is responsible for the management, conservation and protection of living marine resources found off the coast of California in the United States Exclusive Economic Zone. The Protected Resources Division is responsible for conservation and management programs involving endemic and migratory marine mammals and endangered species populations adjacent to California and in the southern and eastern tropical Pacific Ocean. The Division develops regulations and management measures to protect, conserve and restore marine mammal and **endangered species populations**. It conducts consultations under Section 7 of the Endangered Species Act to ensure that Federal agency activities do not adversely affect endangered species, including controversial consultations on major water development projects in California. The Division reviews the status and makes determinations relative to listing species under the Endangered Species Act. It coordinates the activities of recovery teams in preparing recovery plans and monitoring their implementation. The Division reviews and monitors research and public display permits for marine mammals and endangered species. It develops and distributes public information and educational materials about marine mammals and endangered species in the Region.

Data location: **http://swr.nmfs.noaa.gov/psd/prd.htm and http://swr.nmfs.noaa.gov/salmon/maps.htm**

US Environmental Protection Agency (US EPA) – Water Quality Assessment Reports

Data location: *305(b) Water Quality Assessment Reports – Assessed Waters of California by Watershed* **http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=CA#assessed_waters and http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=NV#total_assessed_waters**

California State Water Resources Control Board (SWRCB/RWQCBs)

Data location: *2002 CWA Section 303(d) List of Water Quality Limited Segments* (Lahontan Region 6) – approved by US EPA July 2003 **http://www.waterboards.ca.gov/tmdl/docs/2002reg6303dlist.pdf**

2002 CWA Section 303(d) List of Water Quality Limited Segments (Central Valley Region 5) **http://www.waterboards.ca.gov/tmdl/docs/2002reg5303dlist.pdf**

SPECIES INDICATORS

Habitat

Of the sampled areas, 88% of Sierra watersheds had stretches (21 of 24) whose habitat was adversely affected.

Habitat is the place where the physical and biological elements of ecosystems come together to provide a suitable environment – including food, water, shelter and space – needed for plant and animal livelihood.

Of the sampled areas, 88% of Sierra watersheds had stretches (21 of 24) whose habitat was adversely affected.

Relative habitat quality is an indicator of expected biological values and ability of the watershed to support other designated uses, such as wildlife, fisheries, etc.

Table 4.26 Sampled Watersheds with Stretches Whose Habitat was Adversely Affected

WATERSHED	SPECIFIC WATERBODY
American	American River, Lower
	Folsom Reservoir
Carson	Carson River, East Fork
	Carson River, West Fork
	Indian Creek
Eagle	Eagle Lake
Feather	Feather River, Middle Fork
	Feather River, North Fork
	Feather River, North Fork – East Branch
	Feather River, South Fork
Honey Lake	Honey Lake
	Honey Lake Wetlands
	Susan River
Kaweah	Kaweah River, Lower
	Kaweah River, Upper
	Kaweah Lake
Kern	Isabella Reservoir
	Kern River, Lower
	Kern River, North Fork
Kings	Kings River, Main Fork
	Kings River, South Fork/10 Mile Creek
	Kings River, Upper North Fork
	Pine Flat Reservoir
Merced	McClure Reservoir
	Merced River, Upper

Table 4.26 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
Mokelumne	Mokelumne River, Lower
	Mokelumne River, Upper
Mojave	Mojave River, West Fork
Mono Basin	June Lake
	Lee Vining Creek
	Mill Creek
	Mono Lake
	Mono Lake Area Wetlands
Owens	Goodale Creek
	Haiwee Reservoir
	Hot Creek
	Mammoth Creek
	Owens Lake
	Owens Lake Wetlands
	Owens River
	Owens River, Lower
	Pleasant Valley Reservoir
	Tinemaha Reservoir
	Tuttle Creek
	Twin Lakes
Sac Upper	Shasta Reservoir
	Upper Sacramento River, above Shasta
San Joaquin	Bass Lake
Stanislaus	Stanislaus River
Truckee	Blackwood Creek
	Boca Reservoir
	Bronco Creek
	Cinder Cone Springs
	Donner Lake
	General Creek
	Gray Creek
	Heavenly Valley Creek
	Lake Tahoe
	Little Truckee River
	Martis Creek
	Squaw Creek
	Stampede Reservoir
	Trout Creek
	Truckee River
	Ward Creek

Table 4.26 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
Tule	Success Lake
	Tule River
Tuolumne	Don Pedro Reservoir
Walker	Aurora Canyon Creek
	Bodie Creek
	Bridgeport Reservoir
	Clark Canyon Creek
	Clearwater Creek
	East Walker River, above Bridgeport
	East Walker River, below Bridgeport
	Green Creek
	Hot Springs Canyon Creek
	Robinson Creek
	Rough Creek
	Swauger Creek
	Topaz Lake
	West Walker River
Yuba	Bear River, Lower
	Bear River, Upper
	Bullard Bar Reservoir
	Camp Far West Reservoir
	Combie Reservoir
	Deer Creek
	Englebright Reservoir
	Humbug Creek
	Kanaka Creek
	Little Deer Creek
	Rollins Reservoir
	Scotts Flat Reservoir
	Wolf Creek
	Yuba River, Middle Fork
	Yuba River, North Fork
	Yuba River, South Fork above Edwards
	Yuba River, South Fork below Edwards

Threatened or Endangered Species (TES)

Of the sampled areas 54% of the Sierra watersheds had stretches (13 of 24) that are affected by impacts to threatened or endangered species.

Of the sampled areas 54% of the Sierra watersheds had stretches (13 of 24) that are affected by impacts to threatened or endangered species.

The extent of *threatened* or *endangered* species listed in a particular watershed is an indicator of relative risk of extinction of native species. The terms *threatened* and *endangered* are defined in the federal Endangered Species Act. *Endangered* species are those in danger of extinction throughout all or a significant portion of their range. *Threatened* species are those likely to become endangered in the foreseeable future. NOTE: These terms should not be confused with water quality-based terms "impaired" and "threatened," where "impaired" means a specific designated use is not being met and "threatened" means that a watershed is currently attaining its designated uses but one or more of those uses may become impaired if water quality improvement actions are not taken. In some cases we know the specific species affected by the listing, as outlined in table 4.28.

Table 4.27 Sampled Watersheds with Stretches Affected by Negative Impacts to Threatened or Endangered Species

WATERSHED	SPECIFIC WATERBODY
American	American River, Lower
	Folsom Reservoir
Calaveras	Calaveras River
Carson	Carson River, East Fork
	Carson River, West Fork
	Indian Creek
Eagle Lake	Eagle Lake
Honey Lake	Honey Lake
	Honey Lake wetlands
Kern	Kern River, Lower
Mono Basin	June Lake
	Mill Creek
	Rush Creek
Owens	Crowley Lake
	Mammoth Creek
	Owens River
	Pleasant Valley Reservoir
	Tinemaha Reservoir
	Twin Lakes
Sac Upper	Shasta Lake
Stanislaus	Stanislaus River
Truckee	Blackwood Creek
	Boca Reservoir
	Bronco Creek

Table 4.27 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
Truckee Cont.	Donner Lake Gray Creek Lake Tahoe Little Truckee River Martis Creek Stampede Reservoir Truckee River
Walker	Bodie Creek Green Creek Robinson Creek Rough Creek Swauger Creek Topaz Lake
Yuba	Combie Reservoir Yuba River, South Fork below Edwards Wolf Creek

Table 4.28 Watersheds with Specific Threatened or Endangered Species Information

WATERSHED	SPECIFIC WATERBODY
American	Folsom Reservoir – fall-run Chinook salmon
Carson	Carson River, West Fork – Paiute Cutthroat trout
Honey Lake	Honey Lake Wetlands – Sandhill crane
Mono Basin	June Lake – Yosemite toad, Foothill Yellow-legged frog Mill Creek – Sage grouse
Owens	Owens River – Owens River Pup fish
Truckee	Martis Creek – Lahontan Cutthroat trout

Fishery

Of the sampled area 29% (7 of 24) of Sierra watersheds had stretches with threatened fisheries.

Of the sampled area 29% (7 of 24) of Sierra watersheds had stretches with threatened fisheries.

Fishery refers to the relative health and abundance of naturally reproducing or stocked populations of specific fish species.

Table 4.29 Sampled Watersheds that Had Stretches with Threatened Fisheries

WATERSHED	SPECIFIC WATERBODY
Carson	Carson River, East Fork
Feather	Feather, Middle Fork Feather River, North Fork Feather River, North Fork – East Branch Feather River, South Fork
Kaweah	Kaweah River, Lower Kaweah River, Upper
Kern	Kern River, Lower Kern River, North Fork
Kings	Kings River, Main Fork Kings River, South Fork/10 Mile Creek Kings River, Upper North Fork
Mono Basin	June Lake
Sac Upper	Upper Sacramento River, above Shasta

Native Species

Of the sampled areas 29% (7 of 24) of Sierra watersheds had stretches negatively impacting native species.

Native species are those plants and animals that originate from a specific area; and *non-natives* are those that migrate or are introduced to an area from outside.

The extent of native species or, conversely, a high proportion of non-native species, is an important indicator of relative watershed health since non-native species may act as predators or parasites and often compete with native species for food and habitat.

Of the sampled areas 29% (7 of 24) of Sierra watersheds had stretches negatively impacting native species.

Non-natives may also alter essential habitat, resulting in new aquatic communities that can cause imbalance in a previously stable system, and they may threaten human health and economic well being by reducing or wiping out native species upon which humans depend for food or livelihood.

Table 4.30 Sampled Watersheds with Stretches Negatively Impacting Native Species

WATERSHED	SPECIFIC WATERBODY
American	American River, Lower
Calaveras	Calaveras River
Owens	Haiwee Reservoir
Stanislaus	Stanislaus River
Truckee	Lake Tahoe Truckee River

Table 4.30 Continued From Previous Page

WATERSHED CONT.	SPECIFIC WATERBODY CONT.
Walker	Bridgeport Reservoir East Walker River, below Bridgeport
Yuba	Yuba River, South Fork below Edwards

HYDROLOGY/GEOMORPHOLOGY

Hydrology/geomorphology indicators measure the physical features or characteristics of a particular waterbody that could impact overall health, such as width and depth, water flow, physical alterations to that flow (e.g. dams, diversions), groundwater, extent of wetland areas, percent of different kinds of cover surrounding the water body (from different vegetation types to urban/impervious cover), road/stream crossings, road proximity, streambank stability, erosion hazard, and surrounding land uses. Hydrology/Geomorphology data is often used to augment and/or help interpret other types of data collected.

Freshwater Habitat – extent of freshwater habitat as an indication of potential ability to support aquatic and riparian life and provide other ecosystem services.

Flow Alteration – dams, diversions or channels that either disrupt the free flow of water in a lake, river or wetland area or inundate large areas of aquatic and riparian habitat.

Wetlands – the extent of wetland areas within the watershed.

Groundwater –the water that either flows through or is stored in cracks and crevices and pools under the surface of the ground; the area available for groundwater recharge in the watershed.

Freshwater habitat, flow alteration, wetland loss, and groundwater depletion are serious problems throughout much of the Sierra Nevada range; however the California State Water Board's and US EPA's evaluations were too inconsistent to use in the same context as the measurements of the other indicators.

For example, the data we examined reflects that only about half of Sierra watersheds had stretches that indicate negative impacts to flow alterations and wetlands. A case can easily be made that almost all 24 Sierra watersheds have stretches that are negatively affected by alterations in flow and decrease in functioning wetlands. For example, all but one Sierra watershed have major dams altering their flow. See Appendix B for a list of major dams, reservoirs, and diversions in the Sierra Nevada.

The Alliance urges state and federal agencies to help develop a more practical system of assessing these hydrological indicators.

For this reason we chose to leave out our qualitative assessment findings. The Alliance urges state and federal agencies to help develop a more practical system of assessing these hydrological indicators. Detailed below are some of the specific indicators that the Alliance will evaluate and measure throughout time.

HYDROLOGY/GEOMORPHOLOGY INDICATOR DATA SOURCES

US Environmental Protection Agency (US EPA) – Water Quality Assessment Reports

Data location: *305(b) Water Quality Assessment Reports – Assessed Waters of California by Watershed* **http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=CA#assessed_waters and http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=NV#total_assessed_waters**

California State Water Resources Control Board (SWRCB/RWQCBs)

Data location: *2002 CWA Section 303(d) List of Water Quality Limited Segments* (Lahontan Region 6) – approved by US EPA July 2003 **http://www.waterboards.ca.gov/tmdl/docs/2002reg6303dlist.pdf**

2002 CWA Section 303(d) List of Water Quality Limited Segments (Central Valley Region 5) **http://www.waterboards.ca.gov/tmdl/docs/2002reg5303dlist.pdf**

HYDROLOGY/GEOMORPHOLOGY INDICATORS

Freshwater Habitat

The extent of *freshwater habitat* in a watershed indicates the ability of a watershed or water body to support aquatic and riparian life.

Freshwater habitat can be affected by a variety of human-induced impacts, such as sedimentation from inappropriate development practices or selenium or other harmful runoff from agricultural fields, roads, parking lots or other developed areas.

Flow Alteration

Flow alterations are dams, diversions, or channels that either disrupt the free flow of water in a lake, river, or wetland area or inundate large areas of aquatic and riparian habitat.

These flow alterations can impact ecosystem function and increase habitat fragmentation, change stream channel shape or condition, disrupt natural flow regimes, and drown out large areas of aquatic and riparian habitat. Changes to the system at this scale can impact the lifecycle of water-dependent species by, for example, preventing migrating fish such as salmon and steelhead from reaching necessary spawning grounds in higher-elevation streams. This forces the fish to use less desirable habitat, which can negatively affect their reproductive success. Flow alterations can also affect the habitat of bottom-dwelling (or *benthic*) aquatic insect populations downstream from dams by holding back necessary sediments and nutrients, thereby impacting the food supply for critical life stages of various fish species.

Wetlands

Wetland loss is simply the actual physical loss of wetlands within an aquatic ecosystem. Wetlands are significant to the ecosystem because they are the primary filtering and purifying mechanisms and flood managers in an aquatic environment. Wetland loss can result in increased erosion downstream and possibly sidebank cutting in streams, resulting in heavily incised streams and/or rivers from increased water flow. The loss of wetlands can also directly affect human recreation and commercial uses. People are drawn to wetlands for birdwatching, hunting, fishing and for their natural intrinsic beauty.

Knowing the extent of *wetlands* provides a baseline for future gain/loss measurement; wetland extent also identifies existing areas of high sensitivity. The loss of wetlands represents a loss of natural ecologic function in a river system, which can lead to the possible loss of plant and wildlife breeding grounds and other elements that make wetlands so important to the lifecycles of different species.

Groundwater

Groundwater is the water that either flows through or is stored in cracks and crevices and pools under the surface of the ground (as opposed to *surface water*, which moves or is stored on the surface of the ground as storm runoff, stream or river flow, or in lakes, reservoirs or other surface water bodies). It is the safest and most reliable form of freshwater for drinking and other uses. Groundwater seeps beneath the surface of the ground and is stored in underground reservoirs, called *aquifers*. It is also the source for natural springs and wells.

Aquifers point to areas that are potentially sensitive to further water withdrawals. Withdrawing too much groundwater, for example, can increase the potential for higher salinity in remaining water needed for drinking, irrigation and habitat needs; overwithdrawal can also lead to the dewatering of local drinking wells. Once an aquifer is contaminated, remedial actions to restore healthy water can be extremely costly and lengthy. Possible aquifer contaminants include failing septic systems, landfills, toxic spills, and tank and pipeline leakage.

Chapter 5:

Centralize Data and Fill Gaps

Centralized Water Quality Data Is Needed

There is a lot of data collected about rivers and water quality in particular; but it is collected by many different agencies or entities and is therefore difficult and very time-consuming to track down – especially if you are trying to look at more than one watershed at a time. And few if any agencies or entities collect or assess watershed data at the regional level when it comes to the Sierra. That problem, coupled with the complexity of the Sierra's sheer size (25,000,000 acres and 24 major watersheds and their tributary watersheds) and number of different jurisdictions (2 states, 25 counties, 20+ cities, 200+ communities, countless agencies and organizations), make it very difficult to find data geared specifically to the entire ecoregion.

One of the most important recommendations is for the state to provide data to the public quickly and easily on where, why and for what period of time stretches of Sierra rivers were impaired. In the course of researching this report we could not obtain information with details on why these 303(d) listings occurred. We cannot determine if the impairments are current problems or existed for only a month three years ago. We could not determine if the impairment occurred on 1/8 mile of river stretch or was for the entire river. This inability to quickly provide this basic information is unacceptable.

Here is what we found out from our research. The Human Exposure (*fishable, swimmable, and drinkable*) indicators are based on the US EPA 305(b) lists. Information for this list is collected for the State Water Board through the respective Regional Boards. In the Sierra Nevada, on the western slope the Central Valley Board and on the eastern side the Lahontan Regional Board make assessments of selected watersheds. It should be noted, however, that it is practically impossible for these Water Boards to actually monitor all stretches of all watersheds within their respective regions every two years. The staff time and resources are limited for each Board to do a thorough assessment of all available information and data during each list (i.e. 303(d) and 305(b)) update cycle.

With this in mind it should be noted that there is no present system for the public to obtain information to better understand why their local waterbody may be listed for human exposure impairments.

In the case of the Central Valley Regional Water Quality Control Board the best sources for specific data on why a waterbody may have been listed for impairments to drinkability, fishability or swimmability is if the waterway is currently going through or has gone through a TMDL process. If it is or has been in the TMDL process the best-case scenario would be that the regional board staffers (TMDL teams) would have more insight into the actual specifics of when, how, why and where the waterway was listed as having these human exposure impairments. And then again they most likely will only have specific information to the site in concern.

In the case of the Lahontan Regional Water Quality Control Board, waters are not listed due to single "incidents," but are listed if a statistically significant number of water quality samples over time are in violation of water quality standards, or if a "weight of evidence" case is made for listing using a different approach toward quantitative data. In the past, some waters were listed on the basis of limited qualitative information and/or "best professional judgment." Except for a few waterbodies such as Lake Tahoe, Lahontan Regional Board staff had very little quantitative data available to use for assessment of water quality.

There is no database or "central location" where the public can go and find out exactly why their local waterway may have been listed as having human exposure impairment. The State Board has sources to find this information, but after numerous calls we did not obtain any information providing any details. The Alliance believes the state and regional board are aware of this challenge for the public and are working to develop an improved system. We speak more to this issue in our recommendations.

The State Board is Trying to Centralize Some Data

Staff at the State Boards have indicated that the public will sometime in the future have access to the Surface Water Ambient Monitoring Program database that will hopefully list this specific type of information. Also in development is the California Integrated Water Quality System (CIWQS), a new computer system for the State and Regional Water Quality Control Boards to track information about places of environmental interest, manage permits and other orders, track inspections, and manage violations and enforcement activities. CIWQS also includes an electronic Self Monitoring Report (eSMR) tool for submission of monitoring reports via an Internet web site. CIWQS is part of an overall effort to integrate several disparate legacy systems, compile water quality data, standardize permits, automate processes, and to make data more accessible to State Water Board staff, dischargers, the public, and the U.S. Environmental Protection Agency. **http://www.swrcb.ca.gov/ciwqs/**. These systems will be helpful in addressing some of the issues we have raised here.

Listing Criteria of 303(d) and 305(b) lists inconsistent

One of the only standardized analysis tools for indicators in the range is the State Board and US EPA 303(d) and 305(b) lists. There are limitations with these data sources. Listing criteria for both of these lists has changed over time. For example, in the Lahontan Region listings are based on qualitative best professional judgment rather than quantitative data. There is a current statewide "listing policy" that was adopted in 2004 **http://www.waterboards.ca.gov/tmdl/docs/ffed_303d_listingpolicy093004.pdf**. However prior to the establishment of the statewide listing policy there was no detailed statewide guidance on what should or should not be listed, and on top of that the criteria used for listing varied from Regional Board to Regional Board. So in the Sierra we had two different Regional Boards using two different sets of criteria.

So as noted, the state and regional water boards are aware of the limitations, gaps and lack of centralized record keeping and are interested in improving their systems. We strongly encourage the state legislature and governor to support the State and regional water boards with resources in creating a more thorough, consistent, and publicly accessible record keeping system.

Incorporate Watershed Group Data Into State Data Tracking

Also, more and more individual watershed groups are starting to collect their own detailed watershed data – thanks in part to the Sierra Nevada Alliance's program of training watershed groups in establishing and maintaining volunteer water quality monitoring programs. Currently, there is no agreed-upon central repository for this information. For programs funded by the state of California, the data is at least reported to various state agencies. But once it is reported, it's hard to know where it goes or how to find it. It doesn't appear that this new data source (local watershed group monitoring programs) has been integrated yet into California's vast data system.

The Sierra Nevada Alliance encourages our state agencies to collect the additional following information in Table 5.1 and make it centrally and easily available for the public's interest.

Table 5.1 **Additional Indicators for which information *was not* centralized nor readily available for all watersheds in the Sierra. We recommend this information be monitored, collected and made centrally available in the future.**

INDICATOR	WHAT INDICATOR TELLS US
Human Exposure	
No additional indicators	
Introduced & Naturally Occurring Chemicals	
PAHs (Polycyclic aromatic hydrocarbons)	Potential public health issue; potential carcinogens; related to eating fish. Identified health effects of PAH exposure include cancer and adverse reproductive and developmental effects.
Physical Chemistry	
Total Suspended Solids	Solids that are not in true solution and that can be removed by filtration. Suspended solids usually contribute directly to turbidity. High concentrations of suspended solids can act as transporters of toxins and heavy metals. Suspended solids can also affect water clarity and photosynthesis by aquatic plants. Affects water temperatures and can cause drinking water problems.
Turbidity	Turbidity is the amount of small particles of solid matter suspended in water, as measured by the amount of scattering and absorption of light rays caused by the particles. Turbidity is an indicator of the effects of man-made and natural disturbance. High levels affect water clarity and temperatures. Harmful to aquatic organisms.
Species	
Die-offs/deformities	Disruptions to the ecosystem, loss of recreational opportunity. Indicates imbalance in ecosystem.

Volunteer Monitoring

The South Yuba River Citizen League (SYRCL) Monitoring Program has been funded since 2000 by the California State Water Resources Control Board (SWRCB). Over 200 volunteers were trained during that time to monitor the Yuba for various chemical and physical indicators, such as pH, conductivity, dissolved oxygen and temperature. The volunteers are also trained to collect water samples, which are sent to a state-certified laboratory to be tested for metals, hydrocarbons and bacteria.

All data collection is carried out under a state-approved Quality Assurance Project Plan (QAPP). A Technical Advisory Committee made up of California officials and local agencies and river-monitoring groups analyze the data on a quarterly basis. The approved data is then submitted to the SWRCB for its use. SYRCL, the local watershed group sponsoring the monitoring program, uses the data to identify present and potential disturbances and to provide data about baseline conditions of the Yuba River to federal, state and local agencies. Monitoring data is also used to identify and prioritize potential restoration projects in the Yuba watershed.

The Sierra Nevada Alliance has partnered with SYRCL to launch citizen monitoring programs in a number of watersheds throughout the region through on-site training and mentoring. For more information see **www.sierranavadaalliance.org**.

Table 5.1 Continued From Previous Page

INDICATOR CONT.	WHAT INDICATOR TELLS US CONT.
Species Cont.	
Plant associations and assemblages	Indicator of ecosystem sustainability and species viability. Indicator of potential habitat.
Loss of keystone species	Indicator of habitat loss and ecological change throughout a system.
Hydrology/geomorphology	
Extent of wetlands	Baseline for future gain/loss measurement; identifies existing areas of high sensitivity. Potential indicator of species loss.
% Urban land cover in riparian areas	Baseline for future gain/loss measurement; identifies areas that could be targets for restoration projects.
% Agricultural lands in riparian areas	Baseline for future gain/loss measurement; identifies potential sources of nutrients and other pollutants.
Extent of freshwater ecosystems	Indication of habitat extent and ecosystem extent and potential ability to provide ecosystem services.
Roads and stream crossings; roads near streams	Indication of pollution potential into streams and rivers.
Erosion hazard	Potential for erosion based on slope, soil type and precipitation.
Flow quantity	Amount of water for various purposes eg: drinking water, irrigation, recreation, habitat needs, etc.
Road and trail density	Amount of roads and trails near rivers; potential for erosion and habitat fragmentation.

Chapter 6:

Recommendations and Conclusion

The waters of the Sierra, whose stunning images grace the covers of many calendars and walls, should not be taken for granted. Beneath the beautiful photos and images we carry in our hearts, the swimmability, fishability, and drinkability of our favorite rivers is compromised. The physical, chemical and biological health of these stretches suffers from abuse. Sierra watersheds deserve better than to be relegated to iconic images illustrating the beauty of our region – they need our long-term commitment to their stewardship, protection and restoration.

Watershed Groups Key to Sierra Watershed Health

The Sierra Nevada Alliance believes that local watershed stewardship groups are one of the best vehicles to achieving improvements and preventing further degradation of Sierra watersheds that our nation possesses. There are over 24 watershed groups in the Sierra Nevada. Many of these groups are comprised of multiple stakeholders representing their diverse communities. Members include ranchers, agencies, local homeowners, schools, conservation groups, local government staff, businesses, farmers, and native American tribes. These groups have restored hundreds of acres of meadows, removed invasive species, bio-engineered stable stream banks, picked up millions of pounds of trash, and reduced sedimentation through proper trail and road construction and maintenance. In addition, there are hundreds of volunteers monitoring miles of rivers in the Sierra following state protocols. These groups have done these projects with broad community support, limited resources, and quickly.

The amount of restoration and protection they have achieved will never be met by a government agency alone. We therefore encourage the state of California to prioritize support of these local efforts. These partnerships can match state resources, obtain broad community support, and steward their rivers, lakes and streams on a day-to-day basis.

At the same time we have surveyed Sierra watershed groups and found their capacity not sufficient to the task and their sustainability greatly in question. Most groups lack staff. Those with a central coordinator have only limited funding to support the position. Most groups are completely grant dependent and need to diversify their funding. We fear that without greater investment by state agencies in helping these groups develop a capacity to sustain their work they will disappear. In addition, groups need to do a better job of involving their community and local agencies in funding and supporting their work for the long-term.

Based on the findings of this report and the precarious position of Sierra watershed groups, the Sierra Nevada Alliance calls on our national, state, and local leaders as well as citizens of and visitors to the region to invest more in the protection and restoration of our important Sierra watersheds. The following are suggestions for action by different stakeholders in our watersheds to improve the health of watersheds throughout the Sierra.

State Actions:

- Establish and fund a watershed program and support local stewardship groups. The state has been withdrawing support from its CALFED, Resource Agency and State Water Board watershed programs. It has focused most of its attention on TMDLs. While TMDLS are important, there will simply be more problems and more TMDLs required in the future if the State doesn't start investing more in preventative stewardship.
- Invest additional funding, resources, and staff into the Regional Water Boards so that they may more wholly assess the health of their regions' watersheds.
- Invest in the State Water Board's Surface Water Ambient Monitoring Program. The SWAMP database should be a data retrieval system where the public can find information on important factors such as the details of when, where, and why certain stretches are listed as having impairments for human exposure indicators. The SWAMP database should also be a readily available tool for volunteer monitoring programs to upload and share their monitoring data.
- Fund the Sierra Nevada Conservancy to invest in watershed health. And the Sierra Nevada Conservancy should establish a dedicated Sierra water program focused on partnering with local watershed groups and local agencies to improve wildlife habitat, water quality and water-based recreation in Sierra watersheds.
- Invest in training local watershed stewardship groups on how to diversify their funding base with non-government revenue. Investment in fundraising training will save the state and federal governments money over the medium term. There are more than 50 stewardship groups working with diverse partnerships in communities around the Sierra to protect and restore Sierra watersheds. These groups are at the heart of long-term protection and restoration efforts. At the same time, these groups are 74% dependent on government grants for their staffing and resources. Local watershed groups need to diversify their income base to be able to sustain activities over the years. It would help immensely if government and private foundations would invest now in helping these groups develop sustainable funding bases.

Sierra Residents and Visitors actions:

- *Ranchers* ~ Work with local resource conservation districts, Regional Water Boards, and ranching associations to get assistance in implementing best grazing practices that reduce fecal contamination in rivers, lakes and streams. This can include exclusionary fencing and other methods to keep grazing from negatively impacting sensitive areas.
- *Builders/Construction* ~ Practice Best Management Practices at work sites and with new development.
- *Farmers/Vintners* ~ Reduce pesticide and fertilizer use. Also practice Best Management Practices with fertilizers and pesticides. Practice landscaping that will reduce any site runoff that may contain residues from your property.

- *Homeowners ~*
    - Keep soil on your property: Keeping soil on your property decreases your input of nutrient and contaminants into adjacent waterways and the groundwater.
    - Conserve water: The less water we use, the more water available to fish and wildlife.
    - Implement home landscaping Best Management Practices
    - Call before you dig! Severing sewage lines creates significant pollution and is easily avoidable by coordinating with local public utility districts through the universally accepted "Call before you dig" program.
    - When possible hook up to sewage treatment services to replace septic systems.
    - If septic is the only system available to you, perform regular maintenance and upgrade your equipment whenever possible to prevent leaks and spills.
- *Local County Planning Departments ~* Adopt zoning ordinances that restrict development in sensitive areas; create policies that mandate builders, farmers, ranchers and homeowners to practice stormwater reduction practices.
- *Individuals –*
    - Join a local group working to steward Sierra watersheds visit our website at **www.sierranevadaalliance.org** for more information on groups in your area.
    - Write and call your state and national legislators to request that they invest in state agency support for implementation of the Clean Water Act and funding for a state watershed program.

Agencies, organizations, landowners, residents and visitors can all work together to protect the Sierra's treasured water resources. This requires investing in protection of our healthy watersheds to prevent degradation as well as restoring function and quality where degraded. If this report conveys one message to the reader, it is that Sierra waters cannot be taken for granted and investment of time, money, resources and attention are required by all of us now. We are all the stewards of the Sierra's wealth of rivers, lakes and streams. Our stewardship will determine how these jewels are passed on to future generations.

Endnotes

1 *Sierra Nevada Ecosystem Project, Final Report to Congress, vol. 2, Assessments and Scientific Basis for Management Options* (Davis, CA: University of California, Centers for Water and Wildland Resources, 1996), Ch. 2, pp. 29-30.

2 *SNEP Report*, vol. 2, Ch. 2, pp. 29-30.

3 *SNEP Report*, vol. 1, Ch. 8, p. 129.

4 *SNEP Report*, vol. 1, Ch. 5, p. 77.

5 *SNEP Report*, vol. 1, Ch. 5, p. 79.

6 *SNEP Report*, vol. 1, Ch. 8, p. 125.

7 *SNEP Report*, vol. 2, Ch. 19, p. 557.

8 Information on water-based recreation comes from preliminary draft work (June 20, 2003) on the 2003 State Water Plan Update, as viewed on the California Department of Water Resources website: **www.water.ca.gov.**

9 *Sierra Nevada Wealth Index: Understanding and Tracking Our Region's Wealth* (Truckee, CA: Sierra Business Council, 1999-2000 Edition), pp. 64 and 11.

10 *SNEP Report*, vol. 3, Ch. 23, p. 1011.

11 An *acre-foot* of water is 326,000 gallons, or the amount of water that would cover one acre of land approximately the size of a football field to a depth of one foot. [*California Water Facts* (Sacramento, CA: Water Education Foundation, June 2002), p. 3].

12 *California Water Facts* (Sacramento, CA: Water Education Foundation, June 2002), p. 4.

13 Palmer, Tim. *The South Yuba: A Wild and Scenic River Report* (Nevada City, CA: South Yuba River Citizens League, March 1993), p. 44.

14 Meals, Hank. *Yuba Trails 2* (Nevada City, CA: Hank Meals, 2001), p. 33.

15 Judge Lorenzo Sawyer rendered his decision in the case of *Woodruff v. North Bloomfield Mining and Gravel Company* (Ninth U.S. Circuit Court in San Francisco) on January 7, 1884, prohibiting the discharge of mine tailings of any size or type into the Yuba River. This effectively outlawed the practice of hydraulic mining by making it too expensive to otherwise dispose of the tailings (Meals, p. 34).

16 Palmer, p. 45 and Meals, p. 53.

17 *Layperson's Guide to California Water* (Sacramento, CA: Water Education Foundation, Updated 2000), p. 9.

18 *California Water Map* (Sacramento, CA: Water Education Foundation, 2001 [twelfth printing]).

[19] *Layperson's Guide to California Water*, p. 12.

[20] *California Water Facts*, p. 6.

[21] *California Water Map*

[22] *Nevada Natural Resources Status Report*, "Water Resources & Supply" (Carson City, NV: Nevada Department of Conservation & Natural Resources, August 2002). [http://dcnr.nv.gov/nrp01/env02.htm]

[23] Horton, Gary. *Truckee River Chronology: A Chronological History of Lake Tahoe and the Truckee River and Related Water Issues* (Carson City, NV: Nevada Division of Water Planning, Department of Conservation and Natural Resources, April 1997 [Seventh Update]), p. I-1; and Horton, Gary. *Carson River Chronology: A Chronological History of the Carson River and Related Water Issues* (Carson City, NV: Department of Conservation and Natural Resources, a publication in the Nevada Division of Water Planning's Nevada Water Basin Information and Chronology Series, April 1997 [First Update]), [n.p.] – as viewed on the Nevada Division of Water Planning's website: **www.water.nv.gov.**

[24] Horton, Gary. *Walker River Chronology: A Chronological History of the Walker River and Related Water Issues* (Carson City, NV: Department of Conservation and Natural Resources, a publication in the Nevada Division of Water Planning's Nevada Water Basin Information and Chronology Series, June 1996 [Fourth Update]), [n.p.] – as viewed on the Nevada Division of Water Planning's website: **www.water.nv.gov.**

[25] *California Water Facts*, p. 5.

[26] *California Water Map*.

[27] *SNEP Report*, vol. 1, Ch. 8, p. 131.

[28] The short-lived California Watershed Council, begun under the Davis Administration (as an outgrowth of AB 2117 – Wayne), had a Data and Information Sharing Working Group that was attempting to address the question of watershed data needs, including standardizing collection and reporting protocols; but the Council was disbanded under the Schwarzenegger Administration before any real progress could be made on this issue. Researchers at the University of California, Davis, are also working with academic institutions, non-governmental organizations, and state agencies active in ecosystem restoration, monitoring, and management on a project (outlined in a draft report titled, *Demonstration of an Environmental Indicator System for the CALFED Solution Area)* to standardize and validate environmental indicators used by various agencies and organizations working in the CALFED solution area. Other agencies and entities have also worked out their own indicator frameworks; but to date there is no standardized set of data or data collection or distribution methods widely accepted by the watershed community.

[29] Oregon Watershed Enhancement Board (OWEB) is a state agency established in 1999 by Governor Kitzhaber to promote and fund voluntary actions that enhance Oregon's watersheds. The Board fosters the collaboration of citizens, agencies, and local interests. OWEB's programs support efforts to restore salmon runs, improve water quality, and strengthen ecosystems that are critical to healthy watersheds and sustainable communities. OWEB administers a grant program funded from the Oregon Lottery as a result of a citizen initiative in 1998. The grant program supports voluntary efforts by Oregonians seeking to create and maintain healthy watersheds. For more information on Oregon's watershed program, visit **http://www.oregon.gov/OWEB/about_us.shtml.**

[30] California State Water Quality Assessment Report, Water Quality Assessment Data for the State of California Year 2002, US EPA **[http://oaspub.epa.gov/waters/w305b_report_v2.state?p_state=CA#assessed_waters]** – summarized electronic information submitted by the states to EPA in 2002.

[31] Information on mercury from the South Yuba River Citizens League: **http://www.syrcl.org/majorissues/majorissues-mercury.asp**

[32] Information on sediment and siltation came from the US Environmental Protection Agency and California State Water Resources Control Board's *Clean Water Team* publications and the South Yuba River Citizen League's *Water-Quality Monitoring Field Procedures Manual*.

[33] Information on dissolved oxygen (DO) came from the US Environmental Protection Agency and California State Water Resources Control Board's *Clean Water Team* publications and the South Yuba River Citizen League's *Water-Quality Monitoring Field Procedures Manual*.

[34] Information on conductivity came from the US Environmental Protection Agency and California State Water Resources Control Board's *Clean Water Team* publications and the South Yuba River Citizen League's *Water-Quality Monitoring Field Procedures Manual*.

[35] Information on sediment and siltation came from the US Environmental Protection Agency and California State Water Resources Control Board's *Clean Water Team* publications and the South Yuba River Citizen League's *Water-Quality Monitoring Field Procedures Manual*.

Appendix A:

Watershed Reports - Compilation of Indicators, Watershed by Watershed

American River Watershed

The American River watershed, made up of the Lower (below Nimbus Dam), North Fork (including Middle Fork and Rubicon River), South Fork, and Folsom Reservoir, is California's seventh-largest river. It drains an area of 1,875 square miles in the foothills and mountains of Placer, El Dorado and Alpine counties east of Sacramento. Ranging in elevation from 23 feet to over 10,000 feet, this watershed encompasses a number of different habitat types, including alpine forests, grasslands and riparian oak woodlands, and provides important habitat for fish, birds and other species.

Eight dams in the watershed generate hydropower and provide flood control and drinking water for Sacramento and other cities and farms across California.

The upper portion of the North Fork has been granted federal wild and scenic status, and portions of the Middle and South Forks have been found eligible for similar designation.

State of the American River Watershed Summary

The **Lower American** (27 miles from Nimbus Dam to the confluence with the Sacramento River) is impaired for mercury, manganese, and PCBs, according to the Central Valley Regional Water Quality Control Board, most likely due to resource extraction, agriculture and urban runoff activities, as well as industrial point-source pollution. In addition, OEHHA found the river impaired for fishing; NOAA found it threatened for native species and Threatened and Endangered species; and the US EPA found it impaired for habitat impacts. OEHHA also found the river impaired for tissue concentration and the US EPA found it impaired for impacts to freshwater habitat.

The **South (72 mi), Middle (58 mi) and North Forks (71 mi) of the American** had no impairment data listed from the California State Water Resources Control Board. The US EPA has listed the North Fork and South Fork for wetland impacts. All three were listed as fully supporting "overall use," indicating they are in relatively good shape.

Folsom Reservoir (11450 acres), where the three forks of the American River come together, is listed by the US EPA as impaired for lead. In addition, water quality impacts have affected use of the reservoir for drinking, recreation, and wildlife habitat, as well as impacting threatened or endangered species. The reservoir is also listed as impaired for sediment/silt under the Clean Water Act. The US EPA lists probable sources as unknown.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

AMERICAN	Lower	Middle Fork	North Fork	South Fork	Folsom Reservoir
Metals					X-lead
Manganese	X				
Mercury	X				
PCBs/ Arochlor	I				

Human Exposure

AMERICAN	Lower	Middle Fork	North Fork	South Fork	Folsom Reservoir
Swimmable					I
Drinkable					I
Fishable	I				I
Recreation User Days					I

Species

AMERICAN	Lower	Middle Fork	North Fork	South Fork	Folsom Reservoir
Native status	T				
TES Species	T				I
Habitat	T				I

Physical Chemistry

AMERICAN	Lower	Middle Fork	North Fork	South Fork	Folsom Reservoir
Sediment/ Siltation					I
Tissue	I				I

Who's Working in American River Watershed

Alpine Watershed Group

Contact: Laura Lueders, Alpine Watershed Coordinator

Address: 17300 State Highway 89, Markleeville, CA 96120

Phone: 530.694.2327

Fax: 530.694.2408

Email: watershed@alpinecountyca.com

Web: www.alpinecountyca.com

The Alpine Watershed Group works to preserve and enhance the natural system functions of Alpine County's watersheds for future generations. The group works by inspiring participation to collaborate, educate and proactively implement projects that benefit and steward the county's watersheds. The group is comprised of diverse stakeholders including ranchers, business owners, interested citizens, the Washoe Tribe, government agencies and districts and conservation groups. There are the headwaters of five watersheds in the county: Upper Carson, Upper Mokelumne, Upper Stanislaus, Upper Truckee, and Upper American (Silver Fork).

American River Conservancy

Contact: Alan Ehrgott, Executive Director

Address: PO Box 562, Coloma, CA 95613

Phone: 530.621.1224

Fax: 530.621.4818

Email: ehrgott@arconservancy.org

Web: www.arconservancy.org

The American River Conservancy conducts conservation, education, and stewardship programs to protect and enhance native fisheries, vanishing plant and animal communities, scenic vistas, cultural heritage and recreational lands within the American and Cosumnes River watersheds, which lie in the foothills of the eastern Sacramento Valley. ARC also provides quality nature programs to thousands of school age children each year. As well, ARC conducts monthly nature walks, seasonal docent training, and various other programs that have become quite popular with members of the local communities.

American River Watershed Group (North/Middle Fork)

Contact: William Templin, Watershed Coordinator

Address: PO Box 743, Carmichael, CA 95609

Phone: 916.601.9954

Email: wtemplin@surewest.net

Web: www.arwg.org

The North/Middle Fork American River Watershed Group (ARWG) is a collaborative forum that brings together public and private partners with a goal of working together to improve watershed health. The Group's mission is to sustain environmental and economic health within the American River Watershed and ensure public and firefighter safety. One focus of ARWG is to enhance watershed and habitat values and rehabilitate the forest ecosystem using a watershed-based approach.

American River Watershed Institute (ARWI)

Contact: Otis Wollan, Board President

Address: PO Box 1750, Colfax, CA 95713

Phone: 530.346.7967

Email: otis@foothill.net

The American River Watershed Institute goals and objectives: "1) to support and enhance the research and educational work of the American River Watershed Group in its coordinated Resource Management Plan (CRMP) activities 2) to conduct public discussion groups, forums, panels, lectures, workshops, design charrettes, and conferences to produce public interest educational materials, including, but not limited to, newsletters, pamphlets, books, radios, television, recorded audio and video, electronic media, etc. 3) to complement and enhance the educational and research opportunities for both adults and children about watershed issues, and as necessary to provide and maintain facilities for education and research in, but not limited to, the ecosystems of the American River Watershed, and its forest systems, biology, hydrology, natural systems, as well as the socio-economic human systems in the watershed, as well as the areas having impact on the American River Watershed."

League to Save Sierra Lakes

Contact: Brad Pearson, President

Address: 4521 Holliday Hill Ct, Shingle Springs, CA 95682

Phone: 530.676.7838

Email: bradp@leaguetosavesierralakes.org

Web: www.LeagueToSaveSierraLakes.org

League to Save Sierra Lakes is a grassroots organization that started in December 1991 in response to El Dorado County's attempts to take excessive amounts of water from several high sierra lakes in order to fuel explosive growth in the Highway 50 corridor on the western slope of the Sierra Nevada. The League's activities consist of educating its membership and the general public, performing technical review and comment on water rights application documents and FERC re-licensing proceedings and appropriate litigation when necessary. A complete discussion of issues is found in the League's website.

Protect American River Canyons (PARC)

Contact: Eric Peach

Address: PO Box 9312, Auburn, CA 95604

Phone: 530.885.8878

Email: parc@jps.net

Web: www.parc-auburn.org

Protect American River Canyons is a river education and conservation organization dedicated to the protection of the natural, recreational, cultural and historical resources of the North and Middle Forks of the American River and its canyons. PARC is very active in the community, sponsoring a variety of social, river service and educational events each year. PARC remains vigilant to the political threats to the river canyons.

South Fork American River Watershed Group

Contact: Mark Egbert, District Manager
Address: 100 Forni Road #A, Placerville, CA 95667
Phone: 530.295.5630
Fax: 530.295.5635
Email: Mark-Egbert@ca.nacdnet.org

The Georgetown Divide RCD organized the first South Fork American River Watershed Group meeting in November 2000 and they continue to meet on a monthly basis. Participants represent private landowners, agencies, and non-profit organizations. Their mission is to protect and improve the health and condition of the South Fork American River watershed through stewardship and education to a measurable extent. The group completed the South Fork American River Stewardship Strategy (SFARSS) in 2004. It includes a watershed assessment, which lists specific on-the-ground projects in the watershed that are needed to reduce the threat of catastrophic wildfire and improve water quality. The strategy-identified threatened priority watersheds by water quality degradation, fuel loads, road density, and sedimentation and will be used as a tool to steer watershed group projects.

Assessments Completed in the American River Watershed

Information on the American River Watershed (North, Middle and South Forks) has been recently compiled into an American River Watershed Portal. Below is a link to general documents on the portal and two specific examples of the kinds of information available: www.americanriverwatershed.net/listDocOfType_html?Type=24

Middle Fork American River Watershed Assessment, 2003/01/23

Author: Mary Grim
Publisher: American River Ranger District, Tahoe National Forest
Abstract/Description: Watershed analysis is ecosystem analysis at the watershed scale; it is both analysis and an information gathering process. The purpose is to provide a means by which the watershed can be understood as an ecological system and to develop and document an understanding of the processes and interactions occurring within. This analysis focuses on the issues and key questions specifically identified for this watershed. They are assessed in terms of their biological, physical and social features. Types of information used in the analysis may include: beneficial uses; vegetative patterns and distribution; wildlife species and their habitat; human use patterns; and the importance of vegetative and riparian corridors. The analysis also includes an identification of the management opportunities that will provide background for the development of management decisions in the future.

North Fork American River Watershed Plan and Stewardship Strategy

Author: William Templin

Abstract/Description: This document is the result of three years of collaborative work among the members of the American River Watershed Group and other interested parties to collect data on the watershed, evaluate current conditions, and suggest potential strategies for improving watershed health in the North/Middle Fork American River watershed. Chapters 1 through 3 set the stage, identifying issues of concern, data needs and a framework for evaluation of the different subwatersheds that make up the North/Middle Fork American. In Chapter 4 the project team uses that data and evaluation material to design programmatic and field-level stewardship strategies for improving watershed health. Chapter 5 outlines how those strategies can be put into practice in two pilot projects, Bunch Canyon and the Upper Middle Fork. And Chapter 6 addresses how the project team can monitor and evaluate the overall project recommendations into the future.

Location: Appendices available online at: **http://arwg.org/ARW/ARW-frames.htm**.

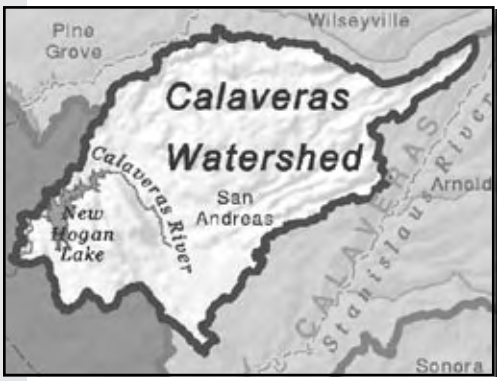
South Fork American River Watershed Assessment 02/2003

Author(s): Mark Egbert, Karen Quidachay, Rick Lind, Susan Britting, Barry Callenberger, Mike Bryan, Dave Thomas, Greg Suba, Eric Bernstein

Publisher: Georgetown Divide Resource Conservation District

Abstract/Description: This Watershed Assessment (WA) focuses on the two priority resource issues identified by the South Fork American River Watershed Group (SFARWG) and Technical Advisory Committee: 1) the state of fire hazard and risk and the factors that contribute to increased risk and hazard; and 2) the state of water quality and the factors that contribute to the impairment of water quality due to increased sedimentation. The assessment attempts to answer two questions: where is the risk and what is at risk? The WA also identifies the top sub-basins in the watershed at risk of increased sedimentation as well as focus questions developed by the SFARWG. These questions are addressed through the use of Global Information Systems, and for each issue the WA evaluates the existing condition of the various sub-basins, assesses the risk or trend in each basin, and prioritizes sub-basins identifying which have the greatest potential to experience adverse effects from fire or water quality. The WA characterizes the unique setting of the watershed, and assets are measured through a variety of means including descriptions of current land use, economy, recreation, cultural resources, vegetation, slope, aspect, soils, and biological resources.

Calaveras River Watershed



The Calaveras River drains from the Sierra crest to the San Joaquin River at the city of Stockton in Calaveras County. Various agencies, including the federal Bureau of Reclamation, Contra Costa Water District, and Stockton East Water District, take water from the river at New Hogan Dam to supply agricultural and urban uses. New Hogan dam also provides flood protection to the city of Stockton.

The National Marine Fisheries Service listed the Calaveras as critical habitat for steelhead, requiring compliance with a habitat plan for the river.

State of the Calaveras River Watershed Summary

Only the Lower Calaveras is included on the California State Water Resources Control Board site, which lists it as impaired for dissolved oxygen, pesticides and pathogens. NOAA lists the Upper Calaveras River as threatened for native species and Threatened and Endangered species. No sources for the impairments are listed.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

CALAVERAS	
Pathogens	I
Pesticides	I

Human Exposure – No Known Impairment

Species

CALAVERAS	
Native status	T
TES Species	T

Physical Chemistry

CALAVERAS	
DO	I

Who's Working in the Calaveras River Watershed

Foothill Conservancy

Contact: Chris Wright, Executive Director
Address: PO Box 1255, Pine Grove, CA 95665-1255
Phone: 209.295.4900
Email: fhc@foothillconservancy.org
Web: www.foothillconservancy.org

This community-based organization is actively involved in issues affecting the quality of life and natural environment in Amador and Calaveras Counties, including land use planning, restoration and protection of the Mokelumne watershed, hydroelectric project operation and relicensing, sustainable economic development and community building, open space protection, mining, and forest management. They are members of the Project 137 Ecological Resources Committee, which guides the adaptive management program for PG&E's Mokelumne River Hydroelectric Project, and the grassroots group member of the California Hydropower Reform Coalition. They publish a periodic newsletter, Foothill Focus, and hold informational public meetings and special events, including an annual Mokelumne River cleanup.

Assessments Completed in the Calaveras River Watershed

N.A.

Caliente Watershed

Caliente Creek is the southernmost water body originated on the western side of the Sierra Nevada. It is located in Kern County, near Bakersfield.

State of the Caliente Watershed Summary

We found no data for this watershed.

Who's Working in the Caliente Watershed

N.A.

Assessments Completed in the Caliente Watershed

N.A.

Carson River Watershed

The upper Carson River basin is part of the Carson River Watershed, which originates in the high Sierra in Alpine County, California and terminates at the Carson Sink and Stillwater Wildlife Refuge in Churchill County, Nevada. The watershed is located between the Lake Tahoe/Truckee River basins and the Walker River watershed. The East Fork of the Carson River originates south of Ebbetts Pass, California in part of the Carson-Iceberg Wilderness at an elevation of 11,460 feet. The West Fork of the Carson River begins near Lost Lakes at about 9,000 feet in elevation. The main stem of the Carson River begins at the confluence of the West and East Forks about a mile southeast of Genoa, Nevada. It continues another 11 miles where it reaches the New Empire Bridge at Deer Run Road, which marks the end of the upper Carson River watershed.

There are a number of major tributary creeks in the upper watershed, which covers approximately 606 square miles in California and 488 square miles in Nevada. There are several small reservoirs in the upper watershed that store water for agricultural use. A section of the East Fork Carson River has been designated as a wild and scenic river. There are no dams on the upper Carson River. Population areas are Markleeville, California, and Minden, Gardnerville, Genoa and Carson City in Nevada.

State of the Carson River Watershed Summary

The **East Fork Carson (48 mi)** is impaired for metals, including zinc, silver, iron and aluminum, as well as for sulfate. These impairments have threatened the use of the watershed for drinking and fishing. In addition, the East Fork Carson is listed as threatened because of impacts to threatened or endangered species, wildlife habitat, fisheries, fish tissue, and freshwater habitat, and it is listed as impaired because of dissolved oxygen, temperature, sediment/silt, and water flow. According to the California State Water Resources Control Board and the US EPA, probable sources of these threats or impairments include: acid mine drainage, water diversion, abandoned mines, agriculture or grazing practices (irrigation tailwater, upland grazing, nurseries), mill tailings, septage disposal, toxic spills, upstream impoundments, golf course activities and general construction activity. The only use that is fully supported on the East Fork Carson is Navigation.

The **West Fork Carson (25 mi)** is listed by the US EPA for metals including iron, and is listed as impaired by the California Water Resources Control Board for nutrients and pathogens (including salinity, toxic inorganics, toxic organics, nitrogen, phosphorous, sulfates and sodium). The West Fork Carson is also listed as impaired for sediment/silt, temperature, habitat, threatened or endangered species wetland impacts and freshwater. The watershed is also threatened for fishing due to fish consumption advisories issued by the Nevada Division of Health. Probable causes of these impairments include: acid mine drainage, atmospheric deposition, water diversions, highway/road/bridge construction and runoff, abandoned mines, agriculture or grazing practices (feeding, irrigation tailwater, nurseries), loss of riparian habitat, urban high density, septic, spills, streambank modification, upstream impoundments, urban runoff/storm sewers, golf course activities, construction, leaking underground tanks.

Indian Creek (13 mi), a tributary to the Carson, is listed as impaired for nutrients, pathogens, swimming, drinking, recreational day use, threatened or endangered species, habitat impacts, flow alterations and freshwater impacts, with probable sources including agriculture, grazing, upstream impoundments, and flow alterations. A TMDL (Total Maximum Daily Load) was approved in 2003 for Indian Creek Reservoir to deal with phosphorous.

Leviathan Creek (3 mi), another tributary, is impaired for metals as a probabley result of mine tailings, acid mine drainage, inactive mining and erosion.

Monitor Creek (4 mi) is impaired for metals, including aluminum, iron, manganese and silver, as well as conductivity. The California Water Resources Control Board also lists sulfates, total dissolved solids in the notes section, but these impacts did not show up as specific listings. Probable sources include mill tailings, mine tailings, acid mine drainage, inactive mining and natural sources.

Other smaller tributaries have impairments listed as well. For example, **Wolf Creek** is impaired for sediment, with probable sources including range, riparian and upland grazing, silvicultural practices and nonpoint sources. **Aspen Creek** and the **California portion of Bryant Creek** are listed by the US EPA for metals. The **Nevada portion of Bryant Creek** is listed by the Nevada Division of Environmental Protection (NDEP) for arsenic, copper, iron and nickel. NDEP also lists this creek as impaired for temperature, total suspended solids, and sediment/siltation. The likely source for these impairments is Leviathan Mine. This creek has a draft TMDL (Total Maximum Daily Load) under the Nevada Division of Environmental Protection for copper, iron and nickel.

Other portions of the watershed in **Nevada** are listed by the US EPA for iron and mercury. The US EPA also lists the Nevada portion of the watershed as impaired for nutrients, temperature, total dissolved solids and sediment/siltation. The NDEP lists this part of the watershed as impaired for fishing and tissue concentration. The Nevada portion of the watershed has a TMDL for nitrate, phosphorus and total dissolved solids.

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T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

CARSON	East Fork	West Fork	Indian Creek	Leviathan Creek	Monitor Creek	Nevada
Metals				X		
Aluminum	X				X	
Iron	X	X			X	X
Manganese					X	
Mercury						X
Nickel						
Silver	X				X	
Zinc	X					
Nutrients	I	I	I			I
Pathogens		I	I			

Human Exposure

CARSON	East Fork	West Fork	Indian Creek	Leviathan Creek	Monitor Creek	Nevada
Swimmable			I			
Drinkable	T		I			
Fishable	T	T				I
Rec User Days			I			

Species

CARSON	East Fork	West Fork	Indian Creek	Leviathan Creek	Monitor Creek	Nevada
TES Species	T	I	I			
Habitat	T	I	I			
Fishery	T					

Physical Chemistry

CARSON	East Fork	West Fork	Indian Creek	Leviathan Creek	Monitor Creek	Nevada
DO	I					
Temperature	I	I				I
pH						
Total Dissolved Solids						I
Conductivity					I	
Sediment/ Siltation	I	I				I
Tissue	T	T				I

Who's Working in the Carson River Watershed

Alpine Watershed Group

Contact: Laura Lueders, Alpine Watershed Coordinator

Address: 17300 State Highway 89, Markleeville, CA 96120

Phone: 530.694-2327

Fax: 530.694.2408

Email: watershed@alpinecountyca.com

Web: www.alpinecountyca.com

The Alpine Watershed Group works to preserve and enhance the natural system functions of Alpine County's watersheds for future generations. The group works by inspiring participation to collaborate, educate and proactively implement projects that benefit and steward the county's watersheds. The group is comprised of diverse stakeholders including ranchers, business owners, interested citizens, the Washoe Tribe, government agencies and districts and conservation groups. There are the headwaters of five watersheds in the county: Upper Carson, Upper Mokelumne, Upper Stanislaus, Upper Truckee, and Upper American (Silver Fork).

Carson River Coalition (CRC)

Contact: Genie Azad, Watershed Coordinator

Address: Carson Water Subconservancy District, 777 E. Williams Street, Suite 110A, Carson City, NV 89701

Phone: 775.887.9005

Fax: 775.887.7457

Email: genie@cwsd.org

Web: www.cwsd.org

In 1998, the Carson Water Subconservancy District began serving as coordinator for the integrated watershed planning process-involving stakeholders within the Carson River Watershed. The Carson River Coalition or CRC is the steering committee for this process. Participants in the CRC include private individuals; local, state and federal agencies; and citizen-driven groups. The goal of watershed process is to establish a program for the long-term management of the resources of the Watershed that addresses the diverse needs and concerns of all stakeholders. The group meets on a bi-monthly basis to discuss current issues and provide information on watershed programs and activities. These meetings are open to the public.

Carson Valley Conservation District (CVCD)

Contact: Paul Pugsley

Address: 1702 County Road, Minden, NV 89423

Phone: 775-782-3661

Fax: 775-782-3547

Email: paul.pugsley@nv.usda.gov

Web: www.conservationdistricts.org/

Established in the 1940's the CVCD supports local resource conservation efforts in Carson Valley, Nevada. The District's support is demonstrated in a number of active ways such as: Implementing the upper Carson River Watershed Plan, improving irrigation practices, noxious weed control, natural resource education and programs such as "Backyard Conservation". The CVCD also co-hosts an annual bioengineering workshop aimed at providing professionals and community members specialized training and hands-on experience in river restoration utilizing bioengineering techniques.

Carson Water Subconservancy District (CWSD)

Contact: Edwin James, General Manager

Address: 777 E. William Street, Suite 110A, Carson City, NV 89701

Phone: 775-887-7456

Fax: 775-887-7457

Email: edjames@cwsd.org

Web: www.cwsd.org

Formed in 1959 the CWSD is a unique multi-county, bi-state agency established to serve as guardian of the Carson River Watershed. Located in Carson City, Nevada, the CWSD works with agencies and organizations that are dedicated to maintaining the health of the watershed. The 13 member Board of Directors consists of elected officials from each of the five counties within the Watershed plus two representatives from the agricultural community. Granted no regulatory authority, the CWSD works within existing governmental frameworks to promote cooperative action for the Watershed that crosses both agency and political boundaries. The CWSD is the coordinating agency for the integrated watershed planning process for the Carson River Watershed and for the Carson River Coalition. The CWSD Staff consists of highly skilled personnel in the areas of water resources, water quality, contract administration and inter-agency cooperation and communication.

Clear Creek Watershed Council

Contact: Margie Evans, Watershed Coordinator

Address: 1701 County Road Suite A1, Minden, NV 89423

Phone: 775-720-0162

Email: meg4bio@sbcglobal.net

Web: www.conservationdistricts.org/ccwc

The Clear Creek Watershed Council's mission is to protect, conserve, and restore the unique and valuable resource of Clear Creek and it's watershed through collaboration, education, planning, and project implementation. Comprised of landowners, concerned citizens, politicians, and natural resource managing agencies that share a common interest and responsibility to address the issues regarding the quality and health of the Clear Creek watershed. Their goals will be attained by identifying and assessing issues of importance in the watershed, enhancing relationships between agencies and stakeholders, educating the members of the council and the community, and coordinating efforts or activities that have an impact on the watershed.

Western Nevada Resource Conservation and Development (WNRC&D)

Contact: Dan Kaffer

Address: P.O. Box 3543, Carson City, NV 89702

Phone: 775-883-2292

Fax: 775-83-5348

Email: Dan.Kaffer@nv.usda.gov

Web: www.powernet.net/~juengers/index.htm

The WNRC&D, located in Carson City, Nevada, is a USDA program that helps local groups plan and implement activities necessary to achieve the development, improvement, conservation and wise use of the natural and human resources of the area. Member-sponsors include Carson City, Churchill, Douglas, Lyon, Storey, and Washoe Counties; Walker River Irrigation District; Carson Water Subconservancy District; eight conservation districts; Washoe Tribe, Pyramid Lake Paiute Tribe, Yerrington Paiute Tribe, Fallon Paiute-Shoshone Tribe, and the Walker River Paiute Tribe. Current projects include river restoration utilizing bioengineering techniques, commercial composting, open space protection, carbon sequestration, streambank stabilization, and floodplain retention. WNRC&D coordinates the Carson River Workdays that have involved over 8,000 community members and over 100 organizations since 1995.

Assessments Completed in the Carson River Watershed

Upper Carson River Watershed Stream Corridor Assessment, Sept. 2002

Author: MACTEC Engineering and Consulting, for the Alpine Watershed Group and Sierra Nevada Alliance
Abstract: The purpose of the assessment is to provide information about the Upper Carson River watershed so that future planning, restoration, and improvement in resource management can occur in a reasoned manner. This document is intended for use by a wide variety of audiences. The hope is decision makers, technical professionals, grant applicants, and the layperson alike will find the report to contain useful information. It is intended to be a management tool for the community, providing perspective into historic and current conditions of the watershed, and guidance on how to maintain or improve natural resource conditions within the watershed.
Location: Copies of this report may be requested from: Alpine Watershed Group, 17300 State Highway 89, Markleeville, CA 96120, (530) 694-2327 or MACTEC Engineering & Consulting, 1572 East College Parkway, Ste 162, Carson City, NV 89706, (775) 888-9992

Fluvial Geomorphic Assessment of the Carson River with Implications for River Management, 1996.

Author: Interfluve, Inc.
Abstract: This assessment provides information on the fluvial geomorphic conditions of the Carson River prior to the 1997 flood. Recommendations and options for enhancement of river stability are presented.
Location: Copies are available from Western Nevada RC&D, Carson Water Subconservancy District and the Carson Valley Conservation District.

Cosumnes River Watershed

The Cosumnes is a small river that flows 80 miles from its headwaters south of the American River through parts of El Dorado and Amador counties to its confluence with the Mokelumne River. The Cosumnes is unique among Sierra rivers because it lacks major dams and related water development facilities. Recognizing its value as something of a baseline for watershed restoration, a number of agencies and entities – including The Nature Conservancy, Bureau of Land Management, Ducks Unlimited, CALFED, the Wildlife Conservation Board, and Sacramento County – created the Cosumnes River Preserve in 1987 to protect the landscape through which the river flows and restore native habitat in flood-prone agricultural fields.

State of the Cosumnes River Watershed Summary

The **Cosumnes River** was not assessed by the California State Water Board/EPA; no impairment or use data is listed on the SWRCB/EPA site.

Who's Working in the Cosumnes River Watershed

American River Conservancy

Contact: Alan Ehrgott, Executive Director
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Email: ehrgott@arconservancy.org
Web: www.arconservancy.org

The American River Conservancy conducts conservation, education, and stewardship programs to protect and enhance native fisheries, vanishing plant and animal communities, scenic vistas, cultural heritage and recreational lands within the American and Cosumnes River watersheds, which lie in the foothills of the eastern Sacramento Valley. We also provide quality nature programs to thousands of school age children each year. As well, ARC conducts monthly nature walks, seasonal docent training, and various other programs that have become quite popular with members of the local communities.

Cosumnes River Task Force

Contact: Tina Lunt, Watershed Coordinator
Address: Sloughhouse RCD/CRTF, 9701 Dino Drive, Suite 170, Elk Grove, CA 95624
Phone: 916.714.1104 ext. 112
Email: tina.lunt@ca.nacdnet.org
Web: www.cosumnesriver.org

Increasing concerns by agencies and individuals over the quality of California watersheds has launched statewide efforts to assess overall watershed health. In an effort to provide for a coordinated assessment and restoration efforts within the Cosumnes Watershed and at the recommendation of the Governor's Flood Emergency Action Team, Sacramento County and the Sloughhouse Resource Conservation District formed the Cosumnes River Task Force (CRTF). "The Mission of the Cosumnes River Task Force is to develop a long term strategy to encourage restoration of watershed health and improve flood management."

Foothill Conservancy

Contact: Chris Wright, Executive Director

Address: PO Box 1255, Pine Grove, CA 95665-1255

Phone: 209.295.4900

Email: fhc@foothillconservancy.org

Web: www.foothillconservancy.org

This community-based organization is actively involved in issues affecting the quality of life and natural environment in Amador and Calaveras Counties, including land use planning, restoration and protection of the Mokelumne watershed, hydroelectric project operation and relicensing, sustainable economic development and community building, open space protection, mining, and forest management. They are members of the Project 137 Ecological Resources Committee, which guides the adaptive management program for PG&E's Mokelumne River Hydroelectric Project, and the grassroots group member of the California Hydropower Reform Coalition. They publish a periodic newsletter, Foothill Focus, and hold informational public meetings and special events, including an annual Mokelumne River cleanup.

Assessments Completed in the Cosumnes River Watershed

Cosumnes River Watershed Inventory and Assessment: Phase II (2003)

Author: Cosumnes River Taskforce

Location: **www.cosumnesriver.org/pdf/phaseII_inventory&assessment.pdf**

Upper Cosumnes River Basin Environmental Assessment, 2000/12/15

Author(s): Karen Quidachay, Susan Britting, Alan Ehrgott

Publisher: American River Conservancy

Location: The American River Watershed Portal also contains information on the Cosumnes at the same website: **www.americanriverwatershed.net/listDocOfType_html?Type=24**

Upper Cosumnes River Watershed Resources Inventory (2002)

Author(s): Cosumnes River Taskforce, Sloughouse RCD, and NRCS

Location: **www.cosumnesriver.org/pdf/cosumnesriver.pdf**

Eagle Lake Watershed

The Eagle Lakes drainage is closely associated with the Honey Lakes drainage. There are no major river systems in the drainage.

State of the Eagle Lake Watershed Summary

Eagle Lake is listed as impaired for mercury by the California State Water Resource Control Board. The US EPA has listed Eagle Lake as impaired for nutrients (toxic organics, nitrogen and phosphorus), pathogens and dissolved oxygen. The US EPA has also listed Eagle Lake as threatened for impacts to fishing and fish tissue, threatened or endangered species, habitat and freshwater. Probable sources for these listings are harmful algal blooms, atmospheric deposition, highway/road/bridge construction and runoff, septic, ag or grazing, general construction, spills, urban runoff/storm sewers, ag/ irrigation tailwater, and high urban density

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

EAGLE LAKE	Eagle Lake
Metals	
Mercury	X
Nutrients	I
Pathogens	I

Human Exposure

EAGLE LAKE	
Fishable	T

Species

EAGLE LAKE	
TES Species	T
Habitat	T

Physical Chemistry

EAGLE LAKE	
DO	I
Tissue	T

Who's Working in the Eagle Lake Watershed

N.A.

Assessments Completed in the Eagle Lake Watershed

Bibliography of studies conducted at Eagle Lake, Lassen County, CA, Updated, July 2004

Author: California State University, Chico
Location: http://www.csuchico.edu/biol/EagleLake/biblio04.htm

Feather River Watershed

The Feather River drains a 3,676-square-mile area in Plumas, Butte, Lassen, Sierra and Tehama counties that ranges in elevation from 7,600 feet to 23 feet at its confluence with the Sacramento River at Verona. It is the northern-most watershed in the Sierra, and is the only watershed to breech the crest of the Sierra. The upper watershed is composed primarily of alpine habitat, while the lower watershed is more agricultural in nature. PG&E has constructed extensive hydroelectric facilities on the North Fork of the Feather, with 10 dams and additional diversions for hydropower generation that leave the North Fork and its tributaries dry for several months of the year. Other projects, such as Oroville Dam and logging and road building upstream have affected the river and water quality in the North Fork.

In contrast, the Middle Fork Feather is a federal wild and scenic river – one of the first designated in the United States.

State of the Feather River Watershed Summary

The **Middle Fork Feather** is listed by the US EPA as impaired for pathogens, pesticides (toxic organics), impacts to drinking water and fishing, temperature, sediment/silt, fish tissue, and wetlands impactsThis part of the watershed is also listed as threatened for impacts to swimming, , recreation user days, habitat, fishery impacts, and freshwater. Probable sources include urban runoff/storm sewers and agriculture.

The **North Fork Feather** is listed by the US EPA as threatened for drinking water, swimming and fishing and as impaired for impacts to wetlands. The California State Water Resources Control Board lists this part of the watershed as threatened for impacts to recreation user days, freshwater resources, fish tissue, habitat and fishery and as impaired for temperature. Probable sources include construction and hydromodification, or modification of the streambed.

The **North Fork-East Branch of the Feather** is listed by the US EPA for copper and zinc and as threatened for impacts to fishing. The California State Water Resources Control Board lists this part of the watershed as impaired for pesticidess, temperature and sediment/siltation and threatened for impacts to swimming, recreation user days, fish tissue, freshwater resources, habitat and fishery. Probable sources of impairment or threat include urban runoff/storm sewers, surface runoff, construction, agriculture, upland grazing, silviculture practices, and resource extraction.

The **South Fork Feather** is listed by the US EPA as threatened for impacts to drinking water and fishing and impaired for wetland impacts. The California State Water Resources Control Board lists the river as impaired for pesticides and threatened for swimming, recreation user days, fish tissue, freshwater impacts, habitat and fishery. Urban runoff, storm sewers and agriculture are the probable sources of impairment or threat. Agricultural and hydropower are “fully supported,” while ecological and recreational uses are not.

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T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

FEATHER	Middle Fork	North Fork	South Fork	North Fork-East Branch
Metals				
Copper				X
Zinc				X
Pathogens	I			
PCBs/ Arochlor	I			
Pesticides	I		I	I

Human Exposure

FEATHER	Middle Fork	North Fork	South Fork	North Fork-East Branch
Swimmable	T	T	T	T
Drinkable	I	T	T	
Fishable	I	T	T	T
Recreation User Days	T	T	T	T

Species

FEATHER	Middle Fork	North Fork	South Fork	North Fork-East Branch
Habitat	T	T	T	T
Fishery	T	T	T	T

Physical Chemistry

FEATHER	Middle Fork	North Fork	South Fork	North Fork-East Branch
Temperature	I	I		I
Sediment/ Siltation	I			I
Tissue	I	T	T	T

Who's Working in the Feather River Watershed

Feather River CRM

Contact: Leslie Mink

Address: PO Box 3880, Quincy, CA 95971

Email: leslie@plumascounty.org

Web: www.feather-river-crm.org

The Feather Coordinated Resource Management (FRCRM) group is a partnership of 22 public and private sector groups who formed in 1985 to collectively improve watershed health in the upper Feather River Watershed. Over 50 watershed projects have been completed including studies and assessments, stream restoration, monitoring, resource management plans, strategic planning, community outreach and educational activities. Over 15 miles of stream and 4,000 riparian acres have been treated over the last decade, at a cost of five million dollars contributed largely by FRCRM partners. The FRCRM recognizes that restoring watershed function is a major priority in reversing erosional trends and improving environmental and economic resources.

Assessments Completed in the Feather River Watershed

Indian Creek Watershed Plan and Environmental Assessment

Author: Feather River Coordinated Resource Management (CRM)

Location: **www.feather-river-crm.org/pdf/indian.pdf**

East Branch North Fork Feather River: Spanish Creek and Last Chance Creek Non-Point Source Water Pollution Study

Location: www.feather-river-crm.org/pdf/spanlast.pdf

Sulphur Creek Watershed Assessment and Restoration Strategy

Location: available on **www.feather-river.com.org**

Honey Lake Watershed

The Susan River is the main river system in the Honey Lake drainage basin. The Susan River runs through the Lassen National Forest. Most of the land that the river flows through is publicly owned. The watershed supports three abundant fish species, including endangered Lahonton cutthroat trout.

State of the Honey Lake Watershed Summary

The **Susan River** is listed for mercury and nickel by the California State Water Resource Control Board. The US EPA has listed the river as impaired for nutrients (which have caused algal blooms) and threatened for fishing. The California Sate Water Resources Control Board has also listed the Susan River as impaired for pH, sediment/siltation, habitat and freshwater impacts and as threatened for fish tissue concentrations. Probabale sources for these listings are highway/road/bridge runoff, urban high density, municipal point sources, ag/grazing, urban runoff/storm sewers, ag/irrigation tailwater, surface runoff, construction, and ag/specialty crop production.

Honey Lake has been listed as impaired for arsenic and conductivity (chloride) by the California State Water Resources Control Board. The US EPA has listed Honey Lake as impaired for pH, sedimentation and siltation, flow alterations, freshwater, habitat, threatened or endangered species impacts, swimming and day use recreation. Probable sources for these impairments are geothermal developments, slow regulation/modification and natural sources.

The **Honey Lake Wetlands** have been listed for arsenic and as impaired for flow alterations by the California Water Quality Control Board. The US EPA has listed the wetlands as impaired for drinking and as threatened for threatened or endangered species impacts, habitat, and freshwater. The probable sources for the above listings are manure lagoons, spills, urban runoff/storm sewers, agricultural and irrigation tailwater and specialty crop production.

Additional smaller tributaries are listed for a variety of issues, as well. **Lassen Creek** is listed as impaired for flow alterations by the California Water Quality Control Board. **Pine Creek** is listed as impaired for sediment/silt by the California Water Board, most likely due to grazing, silviculture, highway/road construction, hydromodification (alteration of the stream bed), removal of riparian vegetation and erosion. And **Skedaddle Creek** is listed by the California Water Board for pathogens (high coliform), likely due to range/riparian and/or upland grazing.

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X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

HONEY LAKE	Susan River	Honey Lake	Honey Lake Wetlands
Metals			
Arsenic		X	X
Mercury	X		
Nickel	X		
Nutrients	I		
Pathogens			

Human Exposure

HONEY LAKE	Susan River	Honey Lake	Honey Lake Wetlands
Swimmable		I	
Drinkable			I
Fishable	T		
Recreation User Days		I	

Species

HONEY LAKE	Susan River	Honey Lake	Honey Lake Wetlands
TES Species		I	T
Habitat	I	I	T

Physical Chemistry

HONEY LAKE	Susan River	Honey Lake	Honey Lake Wetlands
pH	I	I	
Conductivity		I	
Sediment/ Siltation	I	I	
Tissue	T		

Who's Working in the Honey Lake Watershed

Lassen Land & Trails Trust

Contact: Jan Heid, Executive Director

Address: PO Box 1461, Susanville, CA., 96130

Phone: 530.257.3252

Email: lltt@psln.com

Web: www.psln.com/lltt/

Lassen Land & Trails Trust's mission is "the preservation and restoration of land and improvements for historical, educational, recreational, productive, scenic and open opportunities within Lassen County, California." The group is also very active in their watershed. In partnership with Lassen High School and the City of Susanville, LL&TT helped develop a parkway along the Susan River, restoring the riverbank, constructing new trails and building a fishing platform for disabled persons. In cooperation with the City of Susanville, Lassen County and the Susanville Consolidated Sanitary District, LL&TT helped create the greenway that connects Susanville Ranch to Parkdale via a trail along Piute Creek. Future plans include restoration, flood management and land acquisitions along the creek.

Assessments Completed in the Honey Lake Watershed

Draft Environmental Assessment (EA) and Finding of No Significant Impact (FNSI) for the Transfer of Honey Lake at Sierra Army Depot (SIAD), Herlong, CA

A copy of the EA or inquiries into the FNSI may be obtained by writing to Mr. David Bauman, U.S. Army Corps of Engineers,Sacramento District, ATTN: CESPK-PD-R, 1325 J Street, Sacramento, CA 95814 or via email at David.J.Bauman@usace.army.mil.

Kaweah River Watershed

The Kaweah River is located in the southern foothills of the Sierra Nevada and is one of three rivers that originate in Sequoia National Park. The upper Kaweah is comprised of multiple forks, and is almost entirely free flowing. The four upper forks converge very close to Lake Kaweah, which is created by the Army Corps of Engineers Terminus Dam. The lower Kaweah River never reaches the Pacific Ocean, making it one of the shortest drainages in the United States. The lower river is diverted into multiple channels and is mostly consumed by irrigation.

State of the Kaweah River Watershed Summary

The **Upper Kaweah** is listed as impaired for nutrients and pathogens and as threatened for habitat, fishery, and freshwater by the US EPA. Probable sources for these impairments are septic tanks, storm sewers and leaking underground storage tanks.

The **Lower Kaweah** is listed by the US EPA as threatened for the following: swimming, drinking, fishing, and recreational day use. California State Water Resource Control Board has listed the Lower Kaweah as threatened for habitat, fishery, fish tissue concentration and freshwater. The Lower Kaweah is also listed as impaired for flow alterations. The probable source of these listings is construction in the watershed.

The US EPA has listed **Lake Kaweah** for metals including arsenic, copper, and silver. The lake has also been listed as impaired for habitat, sediment/siltation and freshwater by the California State Water Resources Control Board. The US EPA and California Water Board have also listed it as threatened for swimming and recreational day use. The probable sources for these listings are unknown.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

KAWEAH	Upper Kaweah	Lower Kaweah	Lake Kaweah
Metals			
Arsenic			X
Copper			X
Silver			X
Nutrients	I		
Pathogens	I		I

Human Exposure

KAWEAH	Upper Kaweah	Lower Kaweah	Lake Kaweah
Swimmable		T	T
Drinkable		T	
Fishable		T	
Recreation User Days		T	T

Species

KAWEAH	Upper Kaweah	Lower Kaweah	Lake Kaweah
Habitat	T	T	I
Fishery	T	T	

Hydrology/Geomorphology

KAWEAH	Upper Kaweah	Lower Kaweah	Lake Kaweah
Flow Alterations		I	
Freshwater	T	T	I

Who's Working in the Kaweah River Watershed

WildPlaces

Contact: Mehmet McMillan

Address: P.O. Box 853, Springville, CA 93265

Phone: 559.539.5263

Fax: 559.539.5263

Email: info@wildplaces.net

Web: www.wildplaces.net

To protect and restore California's wild and rural places and the people who are a part of these native landscapes through volunteer driven habitat restoration, environmental and cultural education, career development and political action.

Assessments Completed in the Kaweah River Watershed

Landscape Analysis of the Upper Kaweah River watershed

Author: Hume Lake Ranger District of the Sequoia National Forest

Location: www.fs.fed.us/r5/sequoia/news/releases/2005/pf_kaweah_watershed_la.html

The Giant Sequoia National Monument Plan

Author: US Department of Agriculture, Forest Service

Abstract: The management plan Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) were completed in December, 2003. The report includes information on the Kaweah, Kern, Kings, and Tule watersheds.

Location: To see published documents and maps go to **www.fs.fed.us/r5/sequoia/gsnm/feis/**

Kern River Watershed

The Kern river flows 708 miles from the high Sierra in Sequoia National Park and National Forest through other protected and private lands in the Sierra foothills and finally through Bakersfield. The Kern is the longest whitewater river in California. The Upper River has two forks, the north and south. The south fork is entirely free flowing and protected as wild and scenic. The north fork flows through wilderness and National Park land and is also designated wild and scenic. Both upper forks are habitat for the California Golden Trout. The Kern offers many recreational activities and experiences a very heavy use as a result. Lake Isabella, a reservoir at the confluence of the two forks, is one of the largest reservoirs in Southern California at 11,400 acres. The lower Kern, like other rivers in the San Joaquin drainage, does not reach the Pacific due to irrigation consumption. The Kern River Preserve, however, contains some of the last remaining lowland riparian forest and habitat for endangered species.

State of the Kern River Watershed Summary

The **North Fork Kern River** has wetland habitat that has been listed as impaired by the US EPA, which also listed the river as threatened for habitat and impaired for flow alterations. Freshwater habitat and fisheries have been listed as threatened by the California State Water Resource Control Board. Probable sources for the impairment and threatened status are agriculture and nursery operations.

The **Lower Kern** is listed as impaired for conductivity and flow alterations by the California Water Resources Control Board. The US EPA has listed the river as threatened for swimming, drinking, fishing, threatened or endangered species, habitat, fishery impacts, fish tissue concentrations and freshwater. Probable sources for the impairments and threatened status are construction, agriculture or nurseries and habitat modification.

Lake Isabella is listed by the US EPA as impaired for sediment/silt and threatened for swimming, fishing habitat, fish tissue concentrations and freshwater. Probable sources are not known.

The **South Fork Kern** is not listed as impaired or threatened by any government agency.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Species

KERN	North Fork	Lower Kern	Lake Isabella
TES		T	
Habitat	T	T	T
Fishery	T	T	

Introduced and Naturally Occurring Chemicals – No Known Impairment

Human Exposure

KERN	North Fork	Lower Kern	Lake Isabella
Swimmable		T	T
Drinkable		T	
Fishable		T	T

Physical Chemistry

KERN	North Fork	Lower Kern	Lake Isabella
Conductivity		I	
Sediment/ Silt			I
Tissue		T	T

Who's Working in the Kern River Watershed

WildPlaces

Contact: Mehmet McMillan
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Fax: 559.539.5263
Email: info@wildplaces.net
Web: www.wildplaces.net

To protect and restore California's wild and rural places and the people who are a part of these native landscapes through volunteer driven habitat restoration, environmental and cultural education, career development and political action.

Assessments Completed in the Kern River Watershed

The Giant Sequoia National Monument Plan

Author: US Department of Agriculture, Forest Service
Abstract: The management plan Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) were completed in December, 2003. The report includes information on the Kaweah, Kern, Kings, and Tule watersheds.
Location: To see published documents and maps go to **www.fs.fed.us/r5/sequoia/gsnm/feis/**

Kings River Watershed

The Kings River originates high in the Sierra Nevada, at the 12,432-foot elevation in the Golden Trout Wilderness. It flows 130 miles from its headwaters through Fresno, Tulare and Kings counties. The upper reach consists of two main branches: the north fork and the south and Clark's fork. The Kings River is diverted for irrigation purposes relatively high up; the southern branch terminates in the Tulare basin in the San Joaquin Valley, and the north fork flows through the Fresno slough to the San Joaquin River.

State of the Kings River Watershed Summary

The **Main Fork Kings River** is listed by the US EPA as impaired for flow alterations and threatened for habitat, fishery, and freshwater. The probable sources for these detrimental impacts are construction, agriculture or nurseries and hydromodification, or changes to the streambed.

The **South Fork Kings River/**10 Mile Creek is listed by the US EPA as impaired for nutrients, pathogens, habitat, wetlands impacts and freshwater. It is listed as threatened for swimming and recreation use days. Probable sources for these impacts are unknown.

The upper **North Fork** has been listed as impaired for wetland habitat and flow alterations by the US EPA. It is also listed as threatened for habitat, fishery and freshwater by California State Water Resources Control Board. Probable sources include construction, agriculture or nursery operations and modification of the streambed (hydromodification).

Pine Flat Reservoir on the Kings River has been listed by the US EPA as impaired for pathogens, habitat and freshwater and threatened swimming, fishing, recreation user days and fish tissue concentrations.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

KINGS	Main Fork	South Fork	North Fork	Pine Flat Reservoir
Nutrients		I		
Pathogens		I		I

Human Exposure

KINGS	Main Fork	South Fork	North Fork	Pine Flat Reservoir
Swimmable		T		T
Fishable				T
Recreation User Days		T		T

Species

KINGS	Main Fork	South Fork	North Fork	Pine Flat Reservoir
Habitat	T	I	T	I
Fishery	T		T	

Physical Chemistry

KINGS	Main Fork	South Fork	North Fork	Pine Flat Reservoir
Tissue				T

Who's Working in the Kings River Watershed

Friends of the South Fork Kings

Contact: Bill Templin, Coordinator

Address: PO Box 743, Carmichael, CA 95609-0743

Phone: 916.601.9954

Email: wtemplin@surewest.net

Web: www.sfkingsriver.org/

Friends of the South Fork Kings is a non-profit association with a mission to conserve and preserve the natural resources in the South Fork Kings River watershed. To carry out this mission they are increasing awareness and sharing knowledge about changes that are taking place in the South Fork Kings watershed. Some of these changes are natural and some are caused by human activity. Objectives include assuring that future generations will continue to be able to enjoy the experiences that we have enjoyed during our lifetimes in this area. Our approach includes working with existing resource-management agencies to increase the level of appreciation for the resources in this area. Where existing knowledge is limited we will find ways to enhance information and increase awareness of changes taking place in this watershed.

Assessments Completed in the Kings River Watershed

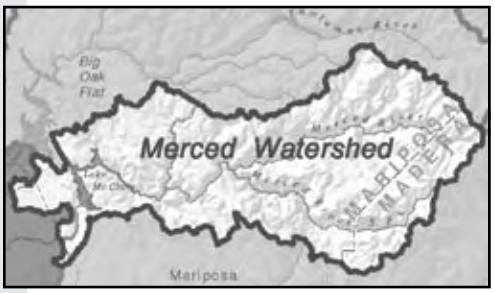
Landscape Analysis Plan Draft 1995

Author: Sierra National Forest
Location: www.fs.fed.us/r5/sierra/kras/lap.html

The Giant Sequoia National Monument Plan

Author: US Department of Agriculture, Forest Service
Abstract: The management plan Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) were completed in December, 2003. The report includes information on the Kaweah, Kern, Kings, and Tule watersheds.
Location: To see published documents and maps go to www.fs.fed.us/r5/sequoia/gsnm/feis/

Merced River Watershed



The Merced River drains 391 square miles, including the backcountry of Yosemite National Park and Yosemite Valley. The river flows 140 miles from its headwaters to its confluence with the San Joaquin River, 91 percent of which are free flowing. The upper river has been classified as Wild and Scenic since 1987. The river experiences a high volume of recreation as it passes through Yosemite Valley and the surrounding National Park. Downstream of Yosemite Valley the river flows through a gorge and goes from slow and meandering to continuous rapids. Below the Merced River gorge, the river enters Lake McClure, created by the New Exchequer Dam; operated by the Merced Irrigation District.

State of the Merced River Watershed Summary

The Upper Section of the **Merced River** has been listed for mercury and as impaired for pathogens, sedimentsiltation and wetlands impacts by the US EPA. The US EPA and the California State Water Resource Control Board have listed the beneficial uses of swimming, drinking and recreational day use as threatened along with the habitat and freshwater. Probable sources for these listings are high-density urban development, municipal point source discharge, urban runoff and storm sewers and leaking underground storage tanks. **Lake McClure** on the Merced River has been listed for mercury by the US EPA and as impaired for swimming, drinking, recreation us, habitat, wetlands impacts and freshwater. The reservoir is listed as threatened for fishing and fish tissue concentrations by the US EPA. The probable cause for these impairments is historical resource extraction.

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T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

MERCED	Upper Merced	Lake McClure
Metals		
General		X
Mercury	X	X
Pathogens	I	

Human Exposure

MERCED	Upper Merced	Lake McClure
Swimmable	T	I
Drinkable	T	I
Fishable		T
Recreation User Days	T	I

Species

MERCED	Upper Merced	Lake McClure
Habitat	T	I
Fishery		

Physical Chemistry

MERCED	Upper Merced	Lake McClure
Sediment/ Siltation	I	
Tissue		T

Who's Working in the Merced River Watershed

Central Sierra Watershed Committee (CSWC)

Contact: Jeannie Habben, Facilitator/Coordinator

Address: P.O. Box 1061, Coarsegold, CA 93614

Phone: 559.642.3263

Fax: 559-658-7170

Email: info@cfwatershed.org

Web: www.crcd.org/wtrshed.html

Since 1997, the CSWC has met monthly with over 20 agencies and private citizens involved in Water Quality & Quantity issues. The goal is to coordinate efforts for identifying problem areas, and finding grants for study/planning and/or implementing solutions. Educational materials on water related subjects are regularly distributed through mailings and area newspapers.

Upper Merced River Watershed Council

Contact: Nancy McConnell, Holly Warner, and Connie Nielson, Co-coordinators

Address: PO Box 746, Mariposa, CA 95338

Phone: 209.966.2221

Fax: 209.221.2056

Email: watershed@sti.net

Web: www.sierratel.com/watershed

The Upper Merced River Watershed Council works with individuals and organizations to protect and enhance the natural, economic, and cultural resources of the Watershed through education, community-based projects, responsible planning, and stewardship. Ongoing projects include: citizen water quality monitoring, invasive removal, trail restoration, an annual Watershed Day, and the creation of a watershed center with a digital library

Assessments Completed in the Merced River Watershed

Upper Merced River Watershed Council has completed the following analysis:

- Baseline water quality monitoring from July 2002 to July 2005
- Streamside survey May 2002
- Monitoring for recreational impacts 2004-2005

Mojave River Watershed

The Mojave River Basin, at 3,600 miles, is one of the largest drainages in California. Nonetheless, the river channel is usually dry due to subterranean flows, evaporation rates, diversion and groundwater pumping. At its origins in the San Bernardino Mountains, snow melt and rain give rise to the West Fork of the Mojave and Deep Creek, the major tributaries of the river.

State of the Mojave River Watershed Summary

The **West Fork Mojave River** has been listed as impaired for nutrients and wetland impacts by the US EPA. The US EPA has listed the river as threatened for swimming, drinking, recreational day use, habitat, groundwater and freshwater impacts. Possible sources for these listings are atmospheric deposition, highways, roads and bridges, urban high density, agricultural irrigation and water diversion, torm sewers, municipal point sources and road construction.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

MOJAVE	West Fork
Nutrients	I

Species

MOJAVE	West Fork
Habitat	T

Human Exposure

MOJAVE	West Fork
Swimmable	T
Drinkable	T
Recreation User Days	T

Physical Chemistry – No Known Impairment

Who's Working in the Mojave River Watershed

N.A.

Assessments Completed in the Mojave River Watershed

Mojave River Conservation Assessment a Preliminary Scoping Report (Powerpoint)

Author: The Nature Conservancy

Location: www.dmg.gov/documents/MojaveRiverSA.ppt

Mokelumne River Watershed

The Mokelumne drains an area that includes four counties – Amador, Calaveras, Sacramento and San Joaquin – and extends from the crest of the Sierra Nevada to the Valley floor. The river is harnessed by 18 separate dams, the majority of which are operated by Pacific Gas and Electric (PG&E) and East Bay Municipal Utility District (EBMUD). There are multiple whitewater runs on the Upper Mokelumne, and salmon habitat restoration is being pursued on the Lower Mokelumne.

State of the Mokelumne River Watershed Summary

The **Upper Mokelumne** has been listed as impaired for pesticides and priority organics, swimming, drinking, fishing, habitat, fish tissue concentrations and freshwater by the US EPA. Probable sources of these impairments are construction and hydromodification.

The **Lower Mokelumne** has been listed as impaired for copper and zinc contamination by the US EPA. The lower section has also been listed as impaired for habitat, dissolved oxygen, pH, and freshwater. Probable sources of these impairments are water diversions, construction, agriculture and upland grazing and resource extraction.

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T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

MOKELUMNE	Upper	Lower
Metals		
Copper		X
Zinc		X
Pesticides	I	

Species

MOKELUMNE	Upper	Lower
Habitat	I	I

Human Exposure

MOKELUMNE	Upper	Lower
Swimmable	I	
Drinkable	I	
Fishable	I	

Physical Chemistry

MOKELUMNE	Upper	Lower
DO		I
pH		I
Tissue	I	

Who's Working in the Mokelumne River Watershed

Alpine Watershed Group

Contact: Laura Lueders, Alpine Watershed Coordinator

Address: 17300 State Highway 89, Markleeville, CA 96120

Phone: 530.694-2327

Fax: 530.694.2408

Email: watershed@alpinecountyca.com

Web: www.alpinecountyca.com

The Alpine Watershed Group works to preserve and enhance the natural system functions of Alpine County's watersheds for future generations. The group works by inspiring participation to collaborate, educate and proactively implement projects that benefit and steward the county's watersheds. The group is comprised of diverse stakeholders including ranchers, business owners, interested citizens, the Washoe Tribe, government agencies and districts and conservation groups. There are the headwaters of five watersheds in the county: Upper Carson, Upper Mokelumne, Upper Stanislaus, Upper Truckee, and Upper American (Silver Fork).

Ebbetts Pass Forest Watch

Contact: Bunny Firebaugh

Address: P.O. Box 2862, Arnold, CA 95223

Phone: 209.795.8260

Email: epfw@goldrush.com

Web: www.forestwatchers.com

The mission of Ebbetts Pass Forest Watch is to protect, promote and restore healthy forests and watersheds while maintaining quality of life in the Sierra Nevada. We organized in response to the massive industrial logging practiced by Sierra Pacific Industries throughout the Sierra Nevada and specifically in Calaveras County. We are not opposed to all logging, but do oppose logging that devastates the forests and replaces them with tree plantations. We are working to promote responsible, sustainable timber harvest practices through public education, legal action, and coordination with other conservation groups.

Ebbetts Pass Rivers and Trails Alliance

Contact: Warren Alford, Interim Coordinator

Address: P.O. Box 2, Avery, CA 95224

Phone: 209.795.2672

Fax: 209.795.2672

Email: warren@sierracampain.org

Web: www.brushwoodinstitute.com/creeks.htm

The Ebbetts Pass Rivers and Trails Alliance focuses on education, outreach, and advocacy primarily on the local scale.

Foothill Conservancy

Contact: Chris Wright, Executive Director

Address: PO Box 1255, Pine Grove, CA 95665-1255

Phone: 209.295.4900

Email: fhc@foothillconservancy.org

Web: www.foothillconservancy.org

This community-based organization is actively involved in issues affecting the quality of life and natural environment in Amador and Calaveras Counties, including land use planning, restoration and protection of the Mokelumne watershed, hydroelectric project operation and relicensing, sustainable economic development and community building, open space protection, mining, and forest management. They are members of the Project 137 Ecological Resources Committee, which guides the adaptive management program for PG&E's Mokelumne River Hydroelectric Project, and the grassroots group member of the California Hydropower Reform Coalition. They publish a periodic newsletter, Foothill Focus, and hold informational public meetings and special events, including an annual Mokelumne River cleanup.

Upper Mokelumne River Watershed Council

Contact: Terry Strange, Watershed Coordinator

Address: 235 New York Ranch Road, Suite D, Jackson CA 95642

Phone: 209.257.1851 ext 105

Fax: 209.257.0910

Email: strangeaqua@volcano.net

The Upper Mokelumne River Watershed Council was originally formed with California Proposition 204 grant in the spring of 2000. The council originally met on an intermittent basis. Since May of 2003, the group has refocused its efforts on water quality, watershed planning, watershed assessment/restoration, and public outreach and education on the Upper Mokelumne River, Dry Creek, and Upper Calaveras River watersheds. The council meets on a monthly basis.

Assessments Completed in the Mokelumne River Watershed

N.A.

Mono Basin Watershed

The Mono Lake Basin is on the Eastern side of the Sierra Nevada. There are no major rivers in the watershed; but many smaller creeks – originating high in the Sierra Nevada – fill Mono Lake. The lake itself is an alkaline lake, typical of the Great Basin environments. For many years the Los Angeles Aqueduct diverted more water than was entering the lake, leading to the rapid shrinking of Mono Lake. Community interest groups, including the Mono Lake Committee, reached an agreement with the California State Water Resources Control Board to divert less water from the lake, allowing for its expansion to closer-to-historic water levels.

State of the Mono Basin Watershed Summary

Mono Lake has been listed by the US EPA for unspecified metals and as impaired for nutrients, swimming, habitat, sedimentation/siltation, and flow alterations. The probable sources for these listings are natural sources along with hydromodification, flow regulation, urban runoff and construction.

June Lake is listed by the California State Water Resource Control Board for mercury and is listed by the US EPA as impaired for nutrients, threatened and endangered species, and sediment/siltation. The US EPA has also listed June Lake as threatened for: swimming, drinking water, fishing, recreational day use, habitat, freshwater, fisheries and fish tissue concentrations. The probable sources for these listings are atmospheric deposition, high urban density, spills, upstream impoundment, agriculture or nurseries, municipal point source pollution.

Rush Creek has been listed by the US EPA as impaired for threatened and endangered species and flow alteration. The probable sources for these impairments are water diversions, spills, upstream impoundment, agriculture or irrigation tailwater, golf course activity and construction.

Lee Vining Creek has been listed as impaired for swimming, habitat, sedimentation/silt, flow alterations and freshwater by the US EPA. Probable sources of these impairments are water diversions, inactive mining, upstream impoundments, agriculture or irrigation tailwater and construction.

Mill Creek has been listed for unspecified metals by the US EPA and as impaired for nutrients and flow alterations by the California State Water Resources Control Board. The US EPA has listed Mill Creek as impaired for swimming, fishing, recreational day use, threatened or endangered species, habitat fish tissue concentrations, and freshwater. Probable sources of these impairments are acid mine drainage, water diversions, inactive mining, spills, construction, agriculture or upland grazing and other unknown sources.

The US EPA has listed the **Mono Lake Wetlands** area as impaired for habitat and flow alterations. No specific sources were listed.

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X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

MONO BASIN	Mono Lake	June Lake	Rush Creek	Lee Vining Creek	Mill Creek	Mono Lake Wetlands
Metals						
General	X				X	
Mercury		X				
Nutrients	I	I			I	
Pathogens						

Human Exposure

MONO BASIN	Mono Lake	June Lake	Rush Creek	Lee Vining Creek	Mill Creek	Mono Lake Wetlands
Swimmable	I	T		I	I	
Drinkable		T				
Fishable		T			I	
Recreation User Days		T			I	

Species

MONO BASIN	Mono Lake	June Lake	Rush Creek	Lee Vining Creek	Mill Creek	Mono Lake Wetlands
TES Species		I	I		I	
Habitat	I	T		I	I	I
Fishery		T				

Physical Chemistry

MONO BASIN	Mono Lake	June Lake	Rush Creek	Lee Vining Creek	Mill Creek	Mono Lake Wetlands
Sediment/ Siltation	I	I		I		
Tissue		T			I	

Who's Working in the Mono Basin Watershed

Mono County Watershed Group

Contact: Greg Newbry, Senior Planner

Address: PO Box 347, Mammoth Lakes, CA 93546

Phone: 760.924.1811

Fax: 760 924 1801

Email: gnewbry@msn.com

Mono County worked with the county Collaborative Planning Team (CPT) successfully and received two Prop 13 grants enabling an effort towards the creation of watershed management plans. The CPT is an active body representing most of the state, federal and local agencies in Mono County. The purposes of the grants are to develop watershed management plans for three of the principal watersheds of Mono County: Upper Owens River Basin, Mono Basin and the West Walker basin. For each basin, the watershed management plans will be developed with input from a watershed council of landowners, agencies, and other local stakeholders, and will be based on an assessment of watershed conditions.

Mono Lake Committee

Contact: Geoff McQuilkin and Fran Spivy-Weber, Co-Executive Directors

Address: Corner of Hwy. 395 & 3rd Street, P.O. Box 29, Lee Vining, CA 93541

Phone: 760.647.6595

Fax: 760.647.6377

Email: info@monolake.org

Web: www.monolake.org

The Mono Lake Committee is a non-profit citizen's group dedicated to protecting and restoring the Mono Basin Ecosystem; educating the public about the impacts on the environment of excessive water use; and promoting cooperative solutions that protect Mono Lake and meet real water needs without transferring environmental problems to other areas. Since 1978, the Mono Lake Committee has fought to protect Mono Lake from excessive water diversions to Los Angeles. Through litigation, legislation, cooperation, and public support, their efforts have been successful. Work remains, however to restore desiccated waterfowl habitat and riparian vegetation, educate the public, promote water conservation, and maintain the Lake's protected status in political arenas.

Assessments Completed in the Mono Basin Watershed

General Information available from Mono Lake Committee (Clearinghouse on Mono Lake)

Location: www.monobasinresearch.org/onlinereports/

North Mono Basin Watershed/Landscape Analysis

Author: US Department of Agriculture, Forest Service

Owens River Watershed

The Owens River is approximately 100 miles long and travels south along the eastern side of the Sierra Nevada. The Owens Valley itself only receives about four to six inches of precipitation a year; but extensive snowmelt from the Sierra and White mountains creates extensive riparian and wetland habitat. The Owens River flows through multiple reservoirs – including Crowley, Pleasant Valley, Haiwee, and Tinemeha. Pleasant Valley and Crowley Reservoirs offer fishing and recreation while the others are closed to the public. For years, the Los Angeles Aqueduct diverted the entire river at Tinemeha reservoir, leaving the lower Owens River dry and leading to the disappearance of the 100-square-mile Owens Lake by 1929. Today, because of local community support and activism, the lower Owens River is set to receive water from the upper reservoirs. Sixty-two miles of the lower Owens River will see initial flows by January 2007 with full implementation by June 2007. This date is four years behind the date agreed to by the Los Angeles Department of Waters and Power. This is due to court challenges by the California Attorney General, Owens Valley Committee and Sierra Club.

State of the Owens River Watershed Summary

The **Owens Rive**r has been listed by the US EPA for arsenic contamination. The EPS has also listed the Owens as impaired for swimming, threatened or endangered species, habitat, sedimentation/siltation flow alterations, wetlands and freshwater and as threatened for drinking and groundwater availability. Probable sources for these impacts are water diversions, grazing or feeding, spills, urban runoff, storm sewers and construction.

The **Lower Owens River** has been listed as impaired by the California State Water Resources Control Board for habitat and freshwater. The US EPA has listed is as impaired for flow alterations and wetland habitat loss. Probable sources for these impairments are urban runoff and storm sewers construction, agriculture and hydromodification.

The US EPA and the California State Water Resources Control Board have listed **Crowley Lake** for mercury and arsenic. The same agencies also listed Lake Crowley as impaired for nutrients (nitrogen and phosphorous), pathogens, swimming, drinking water, and threatened and endangered species. The US EPA has also listed the lake as threatened for fishing and fish tissue concentrations. Probable sources of these listings are agriculture/ grazing, spills, upstream impoundments, urban runoff and storm sewers, agricultural and irrigation tailwater, golf course activities, construction and internal nutrient cycles.

The US EPA has listed **Haiwee Reservoir** for copper and general metals. The EPA has also listed Haiwee as impaired for nutrients, pesticides, swimming, percent of nonnative species, and flow alteration. Drinking water, fishing, habitat, fish tissue and freshwater uses are listed as threatened by the US EPA. Probable sources for many of the listings include nonpoint sources, hydromodification (alteration of the stream bed), and upstream impoundments.

Hot Creek, a major tributary to the Owens River, is listed for arsenic and as impaired by the US EPA for the following: swimming, drinking, recreational day use, habitat and freshwater. Fishing and fish tissue are considered threatened by the EPA. Probable sources are toxic inorganics and metals that are naturally occurring due to the high geothermal activity in the creek.

Owens Lake, or the remnant thereof, is listed for unspecified metals and arsenic. It is also listed by the US EPA as impaired for swimming, drinking water, recreation use, habitat and flow alteration. Probable sources of

these impairments are hydromodification and flow regulation.

Twin Lakes has been listed by the US EPA as impaired for nutrients, threatened or endangered species, habitat, ground water recharging, and freshwater habitat. The California Water Resources Control Board has listed it as impaired for pathogens and posted closures. Probable sources for the above listings are high urban density, construction, agricultural or irrigation tailwater, municipal point source pollution and silviculture.

Other tributaries and reservoirs have been listed as impaired or threatened in the Owens River watershed. **Goodale Creek** is listed as impaired for habitat, sediment/siltation and freshwater by the US EPA. **Mammoth Creek** has been listed for unspecified metals by the California State Water Resources Control Board. The US EPA has listed the creek as impaired for nutrients, fishing, habitat, sedimentation/siltation, fish tissue, flow alterations and freshwater impacts and as threatened for impacts to threatened and endangered species. Probable sources include urban runoff, natural sources, agriculture, silviculture, nonpoint sources, resource extraction, recreation and tourism activities. The **Owens Lake Wetlands** have been listed by the US EPA as impaired for habitat, flow alterations and freshwater, likely due to agricultural activities, nonpoint source pollution, rangeland use and flow regulation. The **Pleasant Valley Reservoir** has been listed by the US EPA as impaired for nutrients, recreation use, threatened or endangered species, habitat, dissolved oxygen, sediment/siltation, groundwater recharge, and wetland habitat and freshwater. Probable sources are flow regulation, non point source pollution, agriculture, upstream impoundment and flow alteration. The **Tinemeha Reservoir** is listed for copper by the California State Water Resources Control Board, and the US EPA lists the reservoir as impaired for nutrients and threatened or endangered species and as threatened for fishing, swimming, recreational day use, habitat, fish tissue and freshwater. The probable source is the use of copper sulfate algaecide along with agriculture, natural sources, and flow alteration. The California State Water Resources Control Board has listed **Tuttle Creek** as impaired for habitat and freshwater and as impaired for fishing, recreation, and fish tissue by the US EPA; probable sources are upland or riparian grazing.

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X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

OWENS	Owens River	Lower Owens	Crowley Lake	Haiwee Reservoir	Hot Creek	Owens Lake	Twin Lakes
Metals							
Arsenic	X		X		X	X	
Cadmium							
Copper				X			
General				X		X	
Mercury			X				
Nutrients			I	I			I
Pathogens							
Pesticides				I			

Human Exposure

OWENS	Owens River	Lower Owens	Crowley Lake	Haiwee Reservoir	Hot Creek	Owens Lake	Twin Lakes
Swimmable	I		I	I	I	I	
Drinkable	T		I	T	I	I	
Fishable			T	T	T		
Recreation User Days					I	I	

Species

OWENS	Owens River	Lower Owens	Crowley Lake	Haiwee Reservoir	Hot Creek	Owens Lake	Twin Lakes
% Non-native				I			
TES Species	I		I				I
Habitat	I	I		T	I	I	I

Physical Chemistry

OWENS	Owens River	Lower Owens	Crowley Lake	Haiwee Reservoir	Hot Creek	Owens Lake	Twin Lakes
Sediment/ Siltation	I						
Tissue			T	T	T		

Who's Working in the Owens River Watershed

Friends of the Inyo

Contact: Paul McFarland

Address: 275 S Main Street #C, Bishop, CA 93514

Phone: 760.873.6400

Fax: 760.873.6500

Email: pmcfarland@qnet.com

Web: www.friendsoftheinyo.org

Friends of the Inyo works to preserve the cultural, ecological, and recreational integrity of Eastern Sierra Public Lands through a combination of direct advocacy, education and resource stewardship projects.

Mono County Watershed Group

Contact: Greg Newbry, Senior Planner
Address: PO Box 347, Mammoth Lakes, CA 93546
Phone: 760.924.1811
Fax: 760 924 1801
Email: gnewbry@msn.com

Mono County worked with the county Collaborative Planning Team (CPT) successfully and received two Prop 13 grants enabling an effort towards the creation of watershed management plans. The CPT is an active body representing most of the state, federal and local agencies in Mono County. The purposes of the grants are to develop watershed management plans for three of the principal watersheds of Mono County: Upper Owens River Basin, Mono Basin and the West Walker basin. For each basin, the watershed management plans will be developed with input from a watershed council of landowners, agencies, and other local stakeholders, and will be based on an assessment of watershed conditions.

Owens Valley Committee

Contact: Nancy Prather, Outreach Coordinator
Address: Drawer D, Lone Pine, CA 93545
Phone/Fax: 760.876.1845
Email: prather@qnet.com
Web: www.ovcweb.org

Owens Valley Committee (OVC) is a non-profit citizen action group dedicated to the protection, restoration and sustainable management of water and land resources affecting Owens Valley. They participate in water and land management issues on lands owned by LADWP. OVC monitors the Long-term Water Agreement between Inyo County and the City of Los Angeles that is attempting to "cooperatively" manage water and land resources on 200,000 acres of the Owens Valley that is owned by LA. Issues include LADWP groundwater pumping for export and its impacts, T&E species and re-watering of 62 miles of the Lower Owens River.

Assessments Completed in the Owens River Watershed

N.A.

Sacramento Upper River Watershed

The Upper Sacramento is the section of the Sacramento River that flows above Shasta reservoir. It is 83% free flowing from its headwaters to the reservoir. The Upper Sacramento used to have a very robust trout fishery. In 1991, however, a train derailed, spilling 72,000 liters of the pesticide metam sodium directly into the river. The pesticide killed the vast majority of aquatic life in a 40-mile stretch of the river, before the toxin dissipated in Shasta reservoir.

State of the Sacramento Upper River Watershed Summary

The **Upper Sacramento River** has been listed by the US EPA for unspecified metals. The river is also listed as threatened for swimming, fishing, recreational day use, habitat, fisheries, fish tissue and freshwater habitat. The probable source of these listings is high urban density.

Shasta Lake is listed for cadmium, copper and zinc by the US EPA. The EPA has also listed Lake Shasta as impaired for pathogens, swimming, threatened and endangered species, habitat and freshwater. The probable sources of these impairments are resource extraction, marinas and boating and additional unknown sources.

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X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

SACRAMENTO	Upper Sacramento	Shasta Reservoir
Metals	X	
Cadmium		X
Copper		X
Zinc		X
Pathogens	I	I

Human Exposure

SACRAMENTO	Upper Sacramento	Shasta Reservoir
Swimmable	T	I
Drinkable		
Fishable	T	
Recreation User Days	T	

Species

SACRAMENTO	Upper Sacramento	Shasta Reservoir
TES Species		I
Habitat	T	I
Fishery	T	

Physical Chemistry

SACRAMENTO	Upper Sacramento	Shasta Reservoir
Tissue	T	

Who's Working in the Sacramento Upper River Watershed

Bear Creek Watershed Group

Contact: James Moller, Watershed Coordinator

Address: Western Shasta RCD, 6270 Parallel Rd, Anderson, CA 96007-4833

Phone: 530.365.7332 x 209

Fax: 530.365.7271

Email:james@westernshastarcd.org

Web: www.westernshastarcd.org and http://wim.shastacollege.edu

Bear Creek is in the south central part of Shasta County and is in the Cascade - Sierra Nevada interface. Stakeholders include ranchers, residents, conservation groups, California Department of Fish & Game, US Fish & Wildlife Service, and the local timber companies. The group is also doing an assessment on all aspects of watershed from anadramous fish, flora, fauna, water quality and quantity, geology, etc. Last year the group did a Salmon redd survey and will be repeating the redd count. Bear Creek Watershed Group is not incorporated.

Butte Creek Watershed Conservancy

Contact: William Johnson

Address: PO Box 1611 Chico, CA 95927

Email: creek@inreach.com

Web: www.buttecreekwatershed.org/

Big Chico Creek Watershed Alliance

Contact: Susan Strachan, Watershed Coordinator

Address: PO Box 461, Chico, CA 95927

Phone: 530.894.1308

Fax: 530.894.1308

Email: coordinator@bigchicocreek.org

Web: www.bigchicocreek.org

Big Chico Creek Watershed Alliance (BCCWA) is a collaborative of landowners, ranchers, local businesses, environmental agencies, residents and other stakeholders. The Alliance has produced a comprehensive existing conditions report. They have completed a stakeholder survey and watershed management strategy. Their mission statement reads: The mission of the Big Chico Creek Watershed Alliance is to protect and enhance the ecological integrity and economic vitality of the Big Chico Creek watershed through cooperative efforts. In partnership with landowners, interested citizens, government agencies and private enterprise, we work to foster education, understanding, sustainable land management, and ecosystem and water quality restoration and conservation.

Dry Creek Watershed Council

Contact: Gregg Bates

Address: PO Box 1311, Roseville, CA 95678

Phone: 916.771.2013

Fax: 916.773.6575

Email: dcc@surewest.net

Web: www.drycreekconservancy.org

The Dry Creek Watershed Council works to protect and restore the watershed to enhance fish, wildlife, and other natural resources. The collaborative recognizes the rights and cultural heritage of landowners in the watershed. DCWC promotes recreational use of the watershed consistent with protection of private property and natural and cultural resources, cooperative partnerships among diverse stakeholders, education on the function and management of a healthy watershed, projects to protect and enhance the fishery and riparian corridors, and optimal passage of stormwater.

Little Chico Creek Watershed Group

Contact Information: Jean Hubbell, Co-founder

Address: PO Box 9229, Chico, CA 95927-9229

Phone: 530.898.5684

Email: jhubbell@csuchico.edu

Web: www.buttecounty.net/waterandresource/watershed_groups.htm

Little Chico Creek Watershed Group's (LCCWG) mission is to preserve, protect, restore and enhance the ecological integrity and economic vitality of the Little Chico Creek Watershed through the cooperative effort of private citizens and public agencies. They are a group of interested landowners, agency representatives and concerned citizens dedicated to the LCCWG mission. A limited Existing Conditions Report with a stream survey, a fish survey, water quality data review and monitoring, land use and management plans review was completed in December 2002. A Steering Committee was formed in fall 1998 and meets approximately twice per year. The meetings are open to the public.

Sacramento River Watershed Program

Contact: Kathy Russick, Program Coordinator

Address: 327 College Street, Suite 205, Woodland, CA 95695

Phone: 530.661.3635

Email: krussick@comcast.net

Web: www.sacriver.org

The mission of the SRWP, as developed by the stakeholders, is: "To ensure that current and potential uses of the watershed's resources are sustained, restored, and where possible, enhanced, while promoting the long-term social and economic vitality of the region." The program provides a network for building a basin-wide context to improve watershed health operating by consensus-based collaboration, coordination of research and monitoring, and enhancing mutual education among stakeholders. The SRWP works to support and preserve the integrity of local efforts. The program runs across the following counties: Butte, Colusa, El Dorado, Glenn, Lake, Lassen, Modoc, Napa, Nevada, Placer, Plumas, Sacramento, Shasta, Siskiyou, Solano, Sutter, Tehama, Yolo, and Yuba.

Assessments Completed in the Sacramento Upper River Watershed

Existing Conditions Report

Author: Big Chico Creek Watershed Alliance
Location: www.www.bigchicocreek.org/

Existing Conditions report

Author: Butte Creek Watershed Conservancy
Location: www.buttecreekwatershed.org/

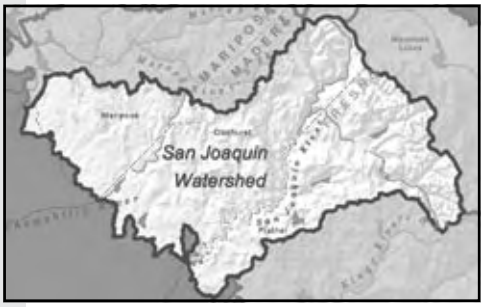
Dry Creek Bank Erosion Control Management Plan (including Existing Conditions Report)

Author: Dry Creek Conservancy
Location: www.drycreekconservancy.org/data/DryCreekBankErosionMangementPlan.pdf
[NOTE: Existing Conditions Report for Secret Ravine is within this report at http://drycreekconservancy.org/SRAMP/sr2.html]

WIM Watershed Information Model – an interactive GIS and data website that will allow you to specifically search for Watershed Assessment information

Author: Shasta RCD
Location: http://wim.shastacollege.edu/watershed_intro.aspx
Note: if you scroll to the bottom of the introduction page there is a graph that tells you which sub-watersheds have been assessed (you can click on the links to the assessment).

San Joaquin River Watershed



The San Joaquin River is the main drainage for the southern Sierra Nevada. The river runs 742 miles from its headwaters in the high Sierra to its terminus in the San Francisco Bay Delta. Its drainage area includes Calaveras, Mariposa, Merced, San Joaquin, Stanislaus, Tuolumne, Fresno, Inyo, Madera, Mono, and San Benito counties. Eight major and 22 minor streams feed into the San Joaquin, the largest being the Stanislaus, Tuolumne and the Merced rivers. The Friant Dam, north of Fresno, impounds the San Joaquin for the purpose of distributing its waters throughout the Central Valley Project. The Friant Dam leaves the San Joaquin River entirely dry until its confluence with the Merced River. Thus the once-healthy San Joaquin salmon run now ends at the Merced River. Restoration efforts have led to two trial releases from the Friant Dam – in 1999 and 2000 – the only time that this section of the river has been rewatered.

State of the San Joaquin River Watershed Summary

The San Joaquin tributary of **Willow Creek** was listed as impaired for pathogens, swimming, drinking and recreational day use by the US EPA. . Probable sources of impairments are municipal point sources and recreational and tourism activities.

Bass Lake has been listed as impaired by the US EPA for nutrients, pathogens and swimming as well as wildlife, freshwater and wetland habitat; sources of impairment are unknown.

The **Upper San Joaquin River** was not assessed by any State or Federal agency, or there were no impairments reported.

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T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Human Exposure

SAN JOAQUIN	Willow Creek	Bass Lake
Swimmable	I	I
Drinkable	I	
Recreation User Days	I	

Species

SAN JOAQUIN	Willow Creek	Bass Lake
Habitat		I

Introduced and Naturally Occurring Chemicals

SAN JOAQUIN	Willow Creek	Bass Lake
Nutrients		I
Pathogens	I	I

Physical Chemistry – No Known Impairment

Who's Working in the San Joaquin River Watershed

Chowchilla/Fresno Rivers Watershed Stakeholders Group

Contact: Jeannie Habben, Watershed Coordinator

Address: P.O. Box 1061, Coarsegold, CA 93614

Phone: 559.642.3263

Fax: 559.658.7170

Email: info@cfwatershed.org

Web: www.cfwatershed.org

Chowchilla/Fresno Watershed Goals: support and promote the integration among watershed efforts with the coordination of stakeholders working together through community involvement and providing public education regarding watershed issues; support and promote grants and program application that achieve our goal for sustainable watershed health and the continuance of Watershed Council Coordinator; provide expertise, advice, educational information and present opportunities to landowners, government agencies and the general public.

Millerton Area Watershed Coalition

Contact: Steve Haze, Program Coordinator

Address: PO Box 529, Prather, CA 93651

Phone: 559.855.5840

Fax: 559.855.3474

Email: sfcsteve@psnw.com

Web: www.sierrafoothill.org/watershed

Since July 2002, the Coalition has been led by a Steering Committee representing landowners, residents and other stakeholders in the Millerton area of eastern Madera and Fresno counties. The group is operating under a grant from the CALFED Program. The group is focused on the Millerton area watershed around the San Joaquin River in the foothills east of Fresno. The watershed encompasses the San Joaquin River drainage from Friant Dam for 26 miles up to Kerckhoff Dam.

Oakhurst River Parkway Partnership

Contact: Sandy Brinley, Human Resources Manager

Address: PO Box 974, Oakhurst, CA 93644

Phone: 559.683.7027

Fax: 559.683.0750

Email: sandyb@stcg.net

The Oakhurst River Parkway is a 3 1/2 mile trail along three rivers in the Oakhurst basin. It is a volunteer, non-profit organization developed to preserve the rivers in their urban area for future generations. They established Watchable Wildlife areas, provided river restoration and sponsored an annual River Clean-up Day. Community volunteers maintain the project with fundraisers and donations. They received several grants for pedestrian bridges and river restoration. The community is proud of the Parkway and in the new Madera County Area Plan for Oakhurst, a land designation has been established to provide proper development along the riverfront of the Fresno River.

RiverTree Volunteers

Contact: Richard F. Sloan

Address: 1509 E. Fallbrook Avenue, Fresno, CA 93720-2744

Phone: 559.696.2971

Fax: 559.322.8620

Email: riverrich1509@aol.com

Web: www.rivertreevolunteers.com

A not for profit organization dedicated to maintenance of the San Joaquin River watershed by working with public land owners, educational groups and individual volunteers, on public lands to educate the public on environmental issues concerning the San Joaquin River watershed.

San Joaquin River Parkway and Conservation Trust

Contact: Sharon Weaver, Watershed Program Director

Address: 1550 E. Shaw Avenue Suite 114, Fresno, California 93710

Phone: 559.433.3190 X2#

Fax: 559.248.8474

Web: www.riverparkway.org/

The mission of San Joaquin River Parkway and Conservation Trust is to preserve and restore San Joaquin River lands having ecological, scenic or historic significance, to educate the public on the need for stewardship, to research issues affecting the river, and to promote educational, recreational and agricultural uses consistent with the protection of the river's resources.

Assessments Completed in the San Joaquin River Watershed

Millerton Area Watershed Assessment

Author: Millerton Area Watershed Coalition

Location: www.sierrafoothill.org/watershed/assessments.htm

Note: Includes: surface and groundwater, sediment, erosion and soils, biodiversity and habitat, fuels and fire, and invasive vegetation and noxious weeds.

Stanislaus River Watershed

The Stanislaus River is one of three main tributaries to the San Joaquin. The Stanislaus flows through the Stanislaus National Forest and the Calaveras Big Trees State Park. The river is then impounded by the New Melones Dam, owned and operated by the Bureau of Reclamation. Below the New Melones Dam, the Stanislaus supports fall-run Chinook salmon. There are restoration efforts underway to improve spawning and rearing beds in this reach of the river.

State of the Stanislaus River Watershed Summary

The **Stanislaus River** is affected by unspecified metals and has been listed by the US EPA as impaired for pesticides, swimming, drinking, fishing, habitat, fish tissue, wetland and freshwater habitat and flow alterations. It is listed by NOAA as threatened for native species status and threatened or endangered species . Probable sources of these impairments are agriculture, hydromodification and other unknown sources.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

STANISLAUS	Main Fork
Metals – unspecified	X
Pesticides	I

Species

STANISLAUS	Main Fork
Native status	T
TES Species	T
Habitat	I

Human Exposure

STANISLAUS	Main Fork
Swimmable	I
Drinkable	I
Fishable	I

Physical Chemistry

STANISLAUS	Main Fork
Tissue	I

Who's Working in the Stanislaus River Watershed

Alpine Watershed Group

Contact: Laura Lueders, Alpine Watershed Coordinator

Address: 17300 State Highway 89, Markleeville, CA 96120

Phone: 530.694-2327

Fax: 530.694.2408

Email: watershed@alpinecountyca.com

Web: www.alpinecountyca.com

The Alpine Watershed Group works to preserve and enhance the natural system functions of Alpine County's watersheds for future generations. The group works by inspiring participation to collaborate, educate and proactively implement projects that benefit and steward the county's watersheds. The group is comprised of diverse stakeholders including ranchers, business owners, interested citizens, the Washoe Tribe, government agencies and districts and conservation groups. There are the headwaters of five watersheds in the county: Upper Carson, Upper Mokelumne, Upper Stanislaus, Upper Truckee, and Upper American (Silver Fork).

Ebbetts Pass Rivers and Trails Alliance

Contact: Warren Alford, Interim Coordinator

Address: P.O. Box 2, Avery, CA 95224

Phone: 209.795.2672

Fax: 209.795.2672

Email: warren@sierracampaign.org

Web: www.brushwoodinstitute.com/creeks.htm

The Ebbetts Pass Rivers and Trails Alliance focuses on education, outreach, and advocacy primarily on the local scale.

Foothill Conservancy

Contact: Chris Wright, Executive Director

Address: PO Box 1255, Pine Grove, CA 95665-1255

Phone:209.295.4900

Email: fhc@foothillconservancy.org

Web: www.foothillconservancy.org

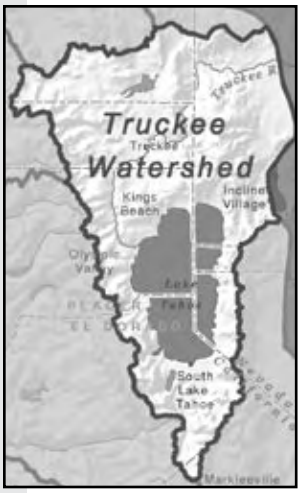
This community-based organization is actively involved in issues affecting the quality of life and natural environment in Amador and Calaveras Counties, including land use planning, restoration and protection of the Mokelumne watershed, hydroelectric project operation and relicensing, sustainable economic development and community building, open space protection, mining, and forest management. They are members of the Project 137 Ecological Resources Committee, which guides the adaptive management program for PG&E's Mokelumne River Hydroelectric Project, and the grassroots group member of the California Hydropower Reform Coalition. They publish a periodic newsletter, Foothill Focus, and hold informational public meetings and special events, including an annual Mokelumne River cleanup.

Assessments Completed in the Stanislaus River Watershed

Central Stanislaus Watershed Analysis

Author: Stanislaus National Forest
Location: www.fs.fed.us/r5/stanislaus/watershed/cswa/index.shtml

Truckee River Watershed



The Truckee River watershed, with an area of roughly 3,000 square miles, encompasses the entire Lake Tahoe, Truckee River and Pyramid Lake systems. For purposes of this report, the watershed is divided into four main sections: (1) the "Upper" Truckee, which flows into Lake Tahoe at the city of South Lake Tahoe; (2) the Lake Tahoe Basin, comprising 63 tributaries that flow directly into the lake, the largest of which is the Upper Truckee; (3) the "Middle" Truckee, which flows out of Lake Tahoe at Tahoe City and runs north and then east through the town of Truckee to the Nevada state line; and (4) the "Lower" Truckee, which flows from the Nevada state line through Reno, terminating at Pyramid Lake. The Lower Truckee is not included in the Sierra Nevada Alliance study area.

The Upper Truckee River watershed is almost entirely within El Dorado County, CA. About three square miles of the southern tip is located in Alpine County, CA. At more than 56 square miles, this watershed is the largest in the Lake Tahoe Basin, comprising 18 percent of the total land area tributary to Lake Tahoe. Land surface elevations range from lake level to 10,063 above sea level at Red Lake Peak. Historically Trout Creek was tributary to the Upper Truckee River in the Truckee Marsh area near Lake Tahoe. But with the development of Tahoe Keys, the Upper Truckee was channeled directly to the lake, and currently the streamflows of the two tributaries only combine during high runoff. Main tributaries to the Upper Truckee include Grass Lake Creek, Angora Creek, Echo Creek and Big Meadow Creek; main tributaries to Trout Creek include Cold Creek, Saxon Creek, Heavenly Valley Creek and Hidden Valley Creek. Major lakes include Upper and Lower Echo Lakes and smaller lakes including Dardanelles, Round, Showers, Elbert, Tamarack, Ralston and Angora in the Upper Truckee drainage and Star Lake in the Trout Creek drainage. The only diversion from the Upper Truckee is from Echo Lake to the American River basin. Groundwater is withdrawn from the Trout Creek drainage for municipal use.

The Lake Tahoe Basin has 63 tributaries that flow directly into the lake, the largest of which is the Upper Truckee. Other major tributaries besides the Upper Truckee/Trout Creek drainage, include: Blackwood Creek, Ward Creek, Meeks Creek, General Creek, Taylor Creek and Spring Creek in California and First Creek, Second Creek, Wood Creek, Third Creek, Marlette Creek, Slaughterhouse Creek, Burke Creek, Edgewood Creek, Logan House Creek, Glenbrook Creek and Incline Creek in Nevada. The lake itself has only one outlet, and that is at Tahoe City, the start of the Middle Truckee River. Lake Tahoe has a surface area of 191 square miles and an average depth of 1,000 feet.

The Middle Truckee River watershed begins at the outflow of Lake Tahoe at Tahoe City, CA, and flows some 15 miles in Placer County to the Town of Truckee in Nevada County and then continues east to the California/ Nevada state line. This area encompasses 428 square miles of mountainous topography. The major tributaries to the Middle Truckee River include: Bear Creek, Squaw Creek, Cabin Creek, Pole Creek, Donner Creek, Trout Creek, Prosser Creek, the Little Truckee River, Gray Creek and Bronco Creek (these last two have their headwaters in Nevada but they ultimately flow into the Middle Truckee in California). The Middle Truckee also has a number of reservoirs or other impoundments, including: Lake Tahoe, Donner Lake, Independence Lake, Webber Lake, Boca Reservoir, Stampede Reservoir, Prosser Creek Reservoir, and Martis Creek Reservoir.

Overall, about 25 percent of the watershed is in California and 75 percent is in Nevada. Lake Tahoe is a natural lake; a small dam was constructed at the outflow, however, to increase storage capacity and implement flow regulation. Lake Tahoe is now 192 square miles. The Truckee is a main source for municipal, industrial, irrigation and hydropower resources for the state of Nevada; about one-fifth of the Truckee's flow is diverted for such uses. While almost all water storage occurs on the California side, Nevada largely regulates the flow and use of the water. Flow regulation occurs in Donner Lake and Prosser, Stampede and Boca reservoirs, among others.

State of the Truckee River Watershed Summary

Upper Truckee

Other tributaries in the Upper Truckee/Trout Creek drainage have been listed as impaired or threatened. **Heavenly Valley Creek** is impacted by unspecified metals and has been listed by the US EPA as impaired for swimming, recreational use, wildlife habitat and freshwater habitat. The creek is also listed as impaired for nutrients, conductivity (chloride) and sediment/siltation by the California State Water Resources Control Board. Probable sources are highway and road runoff, construction practices, hydromodification, recreational and tourism activities and atmospheric deposition. **Trout Creek** is impacted by iron and has been listed as impaired for nutrients and pathogens by the California State Water Quality Control Board. The creek has also been listed by the US EPA as impaired for drinking, habitat, sediment/siltation, and freshwater habitat. Probable sources include urban runoff, erosion, grazing, atmospheric deposition, natural sources and other unknown sources.

Lake Tahoe Basin

Lake Tahoe is impacted by iron and mercury and has been listed by the US EPA as impaired for nutrients (namely nitrogen, phosphorous and other inorganics), pesticides, swimming, recreational use, non-native species, dissolved oxygen, sediment/siltation and flow alterations. The EPA has listed the lake as threatened for drinking, fishing, threatened and endangered species, habitat, fish tissue and freshwater habitat. The probable sources of these impacts include: non-point source pollution, silviculture, construction practices, land development and disturbed sites, urban runoff, highway,/road/ bridge runoff. wastewater,hydromodification, dredging, filling of wetlands, removal of riparian vegetation, habitat modification and streambank modification, marinas, boating and boat discharges, atmospheric deposition and waste storage.

Additional major tributaries to Lake Tahoe have been listed as impaired or threatened. **Blackwood Creek** is impacted by iron and has been listed as impaired for nutrients, pathogens, swimming, drinking, recreation use, threatened and endangered species, wildlife habitat, sediment/siltation and freshwater habitat by the US EPA. Probable sources include agriculture, silviculture, surface runoff, natural sources, erosion, construction practices, atmospheric deposition, grazing, and municipal sources. **General Creek** has been listed by the California State Water Quality Control Board as affected by iron and impaired for nutrients. The US EPA has listed the creek as additionally impaired for pesticides, wildlife habitat and freshwater habitat. Probable sources include silviculture, erosion and atmospheric deposition. **Ward Creek** is affected by iron and has been listed as impaired by the California State Board for iron, nutrients and sediment/siltation and by the US EPA for drinking, recreational use, wildlife habitat and freshwater habitat. Probable sources are silviculture, urban runoff, highway/road runoff, channel erosion and natural sources.

Middle Truckee

The **Middle Truckee Rive**r is impacted by iron, silver and zinc and has been listed as impaired by the US EPA for nutrients, swimming, drinking, non-native species, threatened and endangered species, wildlife habitat, sediment/siltation, flow alterations and freshwater habitat. The river has been listed as threatened for fishing and fish tissue. Probable sources for the above impacts are: wetland loss; water diversion; highway, road and bridge runoff and construction; municipal wastewater; loss of riparian habitat; urban high density development;

spills; stream bank modification; upstream impoundments; agricultural or irrigation tailwater; golf course activities; construction; and leaking underground storage tanks.

Some of the major tributaries, lakes and reservoirs in the Middle Truckee watershed have been listed as impaired or threatened, as well. **Donner Lake** is impacted by unspecified metals and has been listed by the US EPA as impaired for nutrients, pathogens, pesticides, habitat, sediment/siltation and freshwater habitat and as threatened for swimming, drinking, fishing, recreation, threatened and endangered species and fish tissue. The California State Water Quality Control Board has listed the lake as impaired for PCBs. The **Little Truckee River** has been listed as impaired for sediment/siltation and flow alteration and as threatened for fishing, recreational day use, threatened and endangered species, habitat, fish tissue and freshwater habitat by the US EPA. Probable sources for these impacts include silviculture, hydromodification, upstream impoundments, and flow regulation. **Stampede Reservoir** is affected by unspecified metals and has been listed by the US EPA as impaired pesticides and threatened for fishing, threatened and endangered species, wildlife habitat, fish tissue and freshwater habitat. The probable sources of these listings are unknown point sources and natural sources. **Martis Creek** is impacted by unspecified metals and has been listed as impaired for nutrients, swimming, drinking, threatened and endangered species, habitat, sediment/siltation,and flow alteration and freshwater habitat. Probable sources for these impacts include non-point source pollution, silviculture, construction and land development, recreational and tourism activities, land disposal, wastewater and septage disposal, hydromodification, upstream impoundment, highway maintenance, and natural sources. Bronco Creek has been listed as impaired by the US EPA for swimming, drinking, recreational use, threatened and endangered species, wildlife habitat, sediment and siltation, and freshwater habitat. Probably sources include silviculture, nonpoint source pollution and natural sources. **Cinder Cone Springs** has been listed as impaired for nutrients, drinking, wildlife habitat, conductivity and freshwater habitat by the US EPA. Probably sources include land application of wastewater. **Gray Creek** has been listed by the US EPA as impaired for swimming, drinking, recreational use, threatened and endangered species, wildlife habitat, and freshwater habitat and by the California State Water Quality Control Board as impaired for sediment and siltation. Probable sources are silviculture and natural sources. **Squaw Creek** is impacted by unspecified metals and has been listed by the US EPA as impaired for nutrients, pesticides, swimming, drinking, fishing, recreational use, wildlife habitat, fish tissue and freshwater habitat. The California State Board has also listed it for sediment and siltation. Probable sources are construction and land development, urban runoff, filling of wetlands, hydromodification, tourism and recreational activities and natural sources. **Boca Reservoir** is impacted by unspecified metals and has been listed as threatened for fishing, wildlife habitat, threatened and endangered species, fish tissue, and freshwater habitat by the US EPA. Probable sources, beyond natural and general nonpoint sources, are unknown.

Lower Truckee, Nevada, although not in the study area for this report, is listed by the US EPA as impaired for nutrients (nitrogen and phosphorous), recreation use and temperature impacts. **Steamboat Creek, Nevada**, is impacted by mercury, iron and arsenic and is listed as impaired by the US EPA for nutrients.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

NOTE: because the Truckee watershed encompasses more than 60 tributaries, some of which flow directly into Lake Tahoe as opposed to flowing into the Truckee River, we have broken the metrics charts below into three main components: (1) the Upper Truckee and its tributaries, which flows into Lake Tahoe at the city of South Lake Tahoe; (2) the Lake Tahoe Basin, including tributaries that flow directly into the lake; and (3) the Middle Truckee and its tributaries, which flows out of Lake Tahoe at Tahoe City and ends at the California/Nevada state line. The Lower Truckee, which flows from the state line through Reno and terminates in Pyramid Lake, Nevada, is not part of this study.

Introduced and Naturally Occurring Chemicals

TRUCKEE	Upper Truckee	Lake Tahoe Basin	Middle Truckee
Metals			
Unspecified	X	X	X
Iron		X	X
Mercury		X	
Silver			X
Zinc			X
Nutrients	I	I	I
Pathogens		I	I
Pesticides		I	I
PCBs/Arochlor			I

Human Exposure

TRUCKEE	Upper Truckee	Lake Tahoe Basin	Middle Truckee
Swimmable	I	I	I & T
Drinkable		I & T	I & T
Fishable		T	I & T
Recreation User Days	I	I	I & T

Species

TRUCKEE	Upper Truckee	Lake Tahoe Basin	Middle Truckee
% Non-native		I	I
TES Species		I & T	I & T
Habitat	I	I & T	I & T

Physical Chemistry

TRUCKEE	Upper Truckee	Lake Tahoe Basin	Middle Truckee
Conductivity	I		I
DO		I	
Sediment/Siltation	I	I	I
Tissue		T	I & T

Who's Working in the Truckee River Watershed

Alpine Watershed Group

Contact: Laura Lueders, Alpine Watershed Coordinator

Address: 17300 State Highway 89, Markleeville, CA 96120

Phone: 530.694-2327

Fax: 530.694.2408

Email: watershed@alpinecountyca.com

Web: www.alpinecountyca.com

The Alpine Watershed Group works to preserve and enhance the natural system functions of Alpine County's watersheds for future generations. The group works by inspiring participation to collaborate, educate and proactively implement projects that benefit and steward the county's watersheds. The group is comprised of diverse stakeholders including ranchers, business owners, interested citizens, the Washoe Tribe, government agencies and districts and conservation groups. There are the headwaters of five watersheds in the county: Upper Carson, Upper Mokelumne, Upper Stanislaus, Upper Truckee, and Upper American (Silver Fork).

Friends of Squaw Creek

Contact: Ed Heneveld, Chairman

Address: PO Box 2488, Olympic Valley, CA 96146

Phone: 530.583.1817

Fax: 530.583.1557

Email: heneveld@telis.org

Friends of Squaw Creek (FOSC) is a grassroots organization in Squaw Valley comprised of landowners, businesses, jurisdictional agencies, and private citizens dedicated to enhancing the Squaw Creek watershed. FOSC's mission statement is to seek to provide a forum for facilitating and coordinating efforts to promote a naturally sustainable environment for the Squaw Creek watershed through education, communication, science, and community involvement. Goals of FOSC include promoting the creek's ecological system to perform its natural, physical, and biological function considering its uses and constraints. This will include improving communications within the community, improving fish and wildlife habitat, and educating the community on this watershed's ecology.

Lake Tahoe Environmental Education Coalition

Contact: Leslie Allen, Environmental Education Coordinator

Address: PO Box 8208, 865 Tahoe Blvd. Suite 110, Incline Village, NV 89452

Phone: 775.832.4138

Fax: 775.832.4139

Email: allenl@unce.unr.edu

Web: www.lteec.org

The University of Nevada and University of California Cooperative Extensions sponsor Lake Tahoe Environmental Education Coalition (LTEEC). Their mission is to provide support and leadership to improve the overall effectiveness of environmental education at Lake Tahoe by facilitating groups working together to educate and motivate the public about how to protect the Lake Tahoeenvironment.

League to Save Lake Tahoe

Contact: Rochelle Nason, Executive Director

Address: 955 Emerald Bay Rd, South Lake Tahoe, CA 96150

Phone: 530.541.5388

Fax: 530.541.5454

Email: Info@keeptahoeblue.org

Web: www.keeptahoeblue.org

The League to Save Lake Tahoe is the leading environmental organization advocating for the protection and restoration of Lake Tahoe. We are a private not-for-profit membership organization composed of more than 5,000 individuals and families from around the United States and beyond. Since 1957, the League has worked to protect the public interest in the conservation of this extraordinary natural resource.

Placer County Planning Department

Contact: Edmund Sullivan, Senior Planner

Address: 11414 B Avenue, Auburn, CA 95603

Phone: 530.886.3030

Fax: 530.886.3080

Email: esulliva@placer.ca.gov

Web: www.placer.ca.gov

The Placer County Planning Department participates in watershed restoration, watershed plan development, habitat conservation planning, fish passage, and water quality.

Sierra Watershed Education Partnerships

Contact: Robert Wright, Executive Director

Address: PO Box 565, Kings Beach, CA 96143

Phone: 530.546.5795

Email: bob@4swep.org

Web: www.4swep.org

Sierra Watershed Education Partnerships (SWEP) is a small, community-oriented non-profit organization based on the North Shore of Lake Tahoe. In 1995, SWEP received a grant from AmeriCorps and Adopt-A-Watershed and began to incorporate science programs, outdoor field studies, and ecological restoration projects into the curriculum of our local school district. SWEP officially incorporated as a non-profit 501(c)(3) organization in 1997. They have three part-time staff members, a committed volunteer core, and an active Board of Directors that collectively help us achieve our mission: To promote environmental stewardship through comprehensive watershed education, service-learning, and collaborative hands-on community projects.

Truckee River Watershed Council

Contact: Lisa Wallace, Executive Director

Address: PO Box 8568, Truckee, CA 96162

Phone: 530.550.8760

Fax: 530.550.8761

Email: lwallace@truckeeriverwc.org

Web: www.truckeeriverwc.org

The Truckee River Watershed Council (TRWC) was founded in 1998 to protect and restore the water quality and the biological resources of the Truckee River. We identify, coordinate, fund, and implement restoration and preservation projects directly related to the health, beauty, and economy of the watershed. Combining sound science and a deep understanding of our region's values, we focus on the root causes of threats to the Truckee River watershed. We work in a non-confrontational manner, emphasizing collaboration, through a series of stakeholder committees. Some of their more visible projects include Truckee River Day, a one-day restoration work event drawing 400-800 volunteers annually. Other aspects of TRWC's work involve water quality monitoring, informational presentations, identifying restoration projects, and conducting assessments.

Assessments Completed in the Truckee River Watershed

Baseline Assessment of the Middle Truckee

Author: Truckee River Watershed Council

Location: **www.truckeeriverwc.org/Documents/Misc/Truckee%20Rvr%20Watershed%20Baseline%20Assess.pdf**

Natural Land Use History

Author: Truckee River Watershed Council

Location: **www.truckeeriverwc.org/Documents/Watershed%20Committee/1%20TRWC%20CWMS%20Natl%20and%20LandUse%20Hist%20FINAL.11.10.04.doc**

Current Conditions

Author: Truckee River Watershed Council

Location: **www.truckeeriverwc.org/Documents/Watershed%20Committee/2%20TRWC%20CWMS%20Curr%20Con%20FINAL%2011.10.04.doc**

Coordinated Watershed Management Strategy (including Natural Land Use History, Current Conditions and more)

Author: Truckee River Watershed Council
Location: www.truckeeriverwc.org/watershedcommittee.htm (or call for CD –ROM or hard copy options)

Lake Tahoe Watershed Assessment (2000)

Author: US Forest Service
Location: www.fs.fed.us/psw/publications/documents/gtr-175/

Water quality assessment and Modeling of the California Portion of the Truckee River Basin

Author: Desert Research Institute
Location: www.truckee.dri.edu/trwa/trwa.html

Lake Tahoe Basin Watershed Assessment

Author: US Forest Service Pacific Southwest Research Station
Location: www.fs.fed.us/psw/publications/documents/gtr-175/gtr-175-frontmatterI.pdf#xml=http://www.fs.fed.us/cgi-bin/texis/searchallsites/search.allsites/xml.txt?query=Lake+Tahoe+Basin+Watershed+Assessment&db=allsites&id=41bec9e90

Tule River Watershed

The Tule River is the southernmost river that flows directly west from the crest of the Sierra Nevada. It consists of three forks – the North, Middle and South – that together drain 400 square miles. The headwaters of the North and Middle forks originate in Sequoia National Park while the Tule River Indian Reservation comprises the headwaters of the South fork. Much of the upper river flows through Sequoia National Forest. The North and South Forks of the Tule River are impounded by Lake Success reservoir. Below Lake Success reservoir the river flows into the Tulare Lake Bed, a landlocked basin, with the exception of diverted water to the San Joaquin Bain through canals. The habitat quality below the lake is considered poor due to the lack of flow as a result of water consumption from municipal and agricultural usage.

State of the Tule River Watershed Summary

The **Tule River** has been listed by the US EPA as impaired for nutrients, pathogens flow alterations and wetland habitat and as threatened for swimming, drinking, fishing, fish tissue, wildlife habitat and freshwater habitat. Probable sources for these listings are construction and unknown sources.

Lake Success is listed as impaired for nutrients, pathogens and sediment/siltation, and as threatened for swimming, recreational use, wildlife habitat and freshwater habitat. Sources for these listings are unknown.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

TULE	Tule River	Lake Success
Nutrients	I	I
Pathogens	I	I

Human Exposure

TULE	Tule River	Lake Success
Swimmable	T	T
Drinkable	T	
Fishable	T	
Recreational User Days		T

Species

TULE	Tule River	Lake Success
Habitat	T	T

Physical Chemistry

TULE	Tule River	Lake Success
Tissue	T	
Sediment/ Siltation		I

Who's Working in the Tule River Watershed

WildPlaces

Contact: Mehmet McMillan

Address: P.O. Box 853, Springville, CA 93265

Phone: 559.539.5263

Fax: 559.539.5263

Email: info@wildplaces.net

Web: www.wildplaces.net

To protect and restore California's wild and rural places and the people who are a part of these native landscapes through volunteer driven habitat restoration, environmental and cultural education, career development and political action.

River Ridge

Contact: Gary Adest

Address: P.O. Box 879, Springville, CA 93265

Phone: 559.539.0207

Email: info@river-ridge.net

Web: www.river-ridge.net

Gary Adest and Barbara Brydolf bought 722-acre River Ridge on the North Fork Tule River in 2000 when it looked as if the land would end up as a major housing development on the Tule River. By working with the Sequoia Riverlands Trust they were able to place a conservation easement on the ranch and market the development rights. River Ridge is now fully protected in perpetuity and will remain a haven for people seeking personal restoration and recreation and for the flora and fauna that abound on the property.

Assessments Completed in the Tule River Watershed

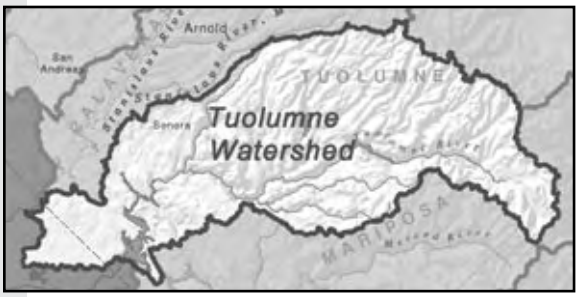
The Giant Sequoia National Monument Plan

Author: US Department of Agriculture, Forest Service

Abstract: The management plan Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) were completed in December, 2003. The report includes information on the Kaweah, Kern, Kings, and Tule watersheds.

Location: To see published documents and maps go to **www.fs.fed.us/r5/sequoia/gsnm/feis/**

Tuolumne River Watershed



The Tuolumne River has its headwaters in the high peaks of Yosemite National Park. The Tuolumne is the largest tributary to the San Joaquin and supports a run of wild Chinook salmon in the Central Valley. It flows through Yosemite for over 54 miles before it reaches Hetch Hetchy Reservoir, which is impounded by O'Shaughnessy Dam. O'Shaunghnessy is owned and operated by the city of San Francisco to provide drinking water for over 2.4 million people.

Above and below O'Shaughnessy Dam, 83 miles of the Tuolumne are classified as Wild and Scenic. The river continues and flows through the Stanislaus National Forest and BLM land. Major tributaries include the Middle, South and North Forks, Cherry Creek, and the Clavey River.

Below these tributaries, the Tuolumne enters the Don Pedro Reservoir, owned and operated by the Modesto and Turlock Irrigation Districts. Here water is regulated for irrigation, power, flood control and recreation.

The river offers many recreational opportunities – both in the National Park and below the park, as well as fishing and boating at Don Pedro Reservoir downstream. Swimming and boating are however not allowed in the O'Shaughnessy Reservoir; fishing is permitted as long as one can find a way to get down to the reservoir. Restoration projects are underway to improve salmon habitat in the Lower Tuolumne, to protect the Clavey River – the Tuolumne's largest tributary – from possible damming, and to possibly decommission O'Shaughnessy Dam.

State of the Tuolumne River Watershed Summary

The **Tuolumne River** has been listed as impaired by the US EPA for pesticides, swimming, drinking, fishing and fish tissue. Probable sources of the impairments are agricultural activities and other unknown sources.

The **Don Pedro Reservoir** is impacted by mercury and has been listed as impaired for swimming, fishing, wildlife habitat, fish tissue and freshwater habitat by the US EPA. Probably sources include resource extraction.

Dunn Creek is affected by mercury and has been listed by the US EPA as impaired for swimming, drinking, fishing and fish tissue. The probable source for these impacts is resource extraction.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

TUOLUMNE	Tuolumne River	New Don Pedro Reservoir	Dunn Creek
Metals			
Mercury		X	X
Pesticides	I		

Human Exposure

TUOLUMNE	Tuolumne River	New Don Pedro Reservoir	Dunn Creek
Swimmable	I	I	I
Drinkable	I		I
Fishable	I	I	I

Species

TUOLUMNE	Tuolumne River	New Don Pedro Reservoir	Dunn Creek
Habitat		I	

Physical Chemistry

TUOLUMNE	Tuolumne River	New Don Pedro Reservoir	Dunn Creek
Tissue	I	I	I

Who's Working in the Tuolumne River Watershed

Clavey River Ecosystem Project

Contact: Glenda Edwards, Stakeholder

Address: 17860 Wards Ferry Rd, Sonora, CA 95370-8655

Phone: 209.532.7110

Fax: 209.536.0876

Email: gedwards@inreach.com

Web: www.fs.fed.us/r5/stanislaus/watershed/crep/ or www.claveyriver.net

The Clavey River Ecosystem Project (CREP) was formed for the purpose of producing a scientifically credible assessment and analysis of the watershed of the Clavey River that would have wide support. CREP is comprised of interested stakeholders from a variety of backgrounds (ranching, logging, recreation, OHV, education, environmental and business). CREP participants recognize the value of working together to better understand the existing conditions of the Clavey River watershed. It is the intention of CREP participants to develop and use that understanding to recommend specific on-the-ground projects and potential management direction to help improve the health of the watershed.

Restore Hetch-Hetchy

Contact: Ron Good, Executive Director

Address: P.O. Box 3538, Sonora, CA 95370

Phone: 925.533.4481

Email: ron@hetchhetchy.org

Web: www.hetchhetchy.org

Our goal is to restore and protect Hetch Hetchy Valley located in Yosemite National Park and its associated natural resources, including the Tuolumne River; and to accomplish a "win-win" outcome for Hetch Hetchy Valley, and for the cities of the Bay Area and the Turlock and Modesto Irrigation Districts that rely on Hetch Hetchy water and power – drop for drop, kilowatt for kilowatt, and dollar for dollar – to the extent that is technically feasible. Restore Hetch-Hetchy is currently implementing an aggressive public education and outreach campaign that includes coalition building with like-minded organizations, and a petition drive targeted at the Secretary of the Interior.

Tuolumne River Trust

Contact: Monica Weakley, Sierra Nevada Program Director

Address: P.O. Box 612, Groveland, CA 95321

Phone: 209.588.8636

Fax: 209.588.8019

Email: monica@tuolumne.org

Web: www.tuolumne.org

The Tuolumne River Trust works diligently to promote the stewardship of the Tuolumne River and its tributaries to ensure a healthy watershed. In the Sierra, the Trust's Clavey Campaign is building the groundwork for federal Wild and Scenic designation for the Clavey River and educates key audiences and the local community at the Exploration Center in Groveland. In the Central Valley, the Trust is working to expand the floodway, increase flows to restore salmon habitat, and partnering with other groups to create the Lower Tuolumne River Parkway,

a public/private mosaic of improved habitat and recreation on the Lower Tuolumne River. The Trust is also advocating improved conversion measures in San Francisco as an alternative to increased diversions from the Tuolumne proposed in San Francisco's Water Supply Improvement Program.

Assessments Completed in the Tuolumne River Watershed

Clavey River Wild and Scenic Value Review

Author: Stanislaus National Forest
Location: www.fs.fed.us/r5/stanislaus/publications/clavey-review.pdf

Walker River Watershed

The Walker River is one of the last undeveloped eastern Sierra drainages. It originates at the crest of the Sierra Nevada in two forks – the East and West Rivers. The vast majority of precipitation and snow melt that feed the Walker occur in California, but only 25 percent of the actual watershed is within the state. Both rivers flow east into Nevada and join to become the Walker River. The river terminates in Walker Lake, a very large but poor-quality lake; it experiences frequent algal blooms. Portions of the West Walker have been protected as Wild and Scenic; both rivers have premium trout fisheries. The most prevalent management conflict is between California fisheries and Nevada irrigators.

State of the Walker River Watershed Summary

The **West Walker River** is affected by metals including manganese, copper and arsenic and has been listed by the US EPA as impaired for nutrients, swimming, drinking, recreation, habitat, sediment/siltation, wetland habitat and freshwater habitat. The probable sources for these impacts are urban high density development, spills, urban runoff, storm sewers, agricultural and irrigation tailwater, construction, upland agriculture and grazing and other unknown sources.

West Walker, Nevada, is impacted by iron and other metals and has been listed as impaired by the US EPA for nutrients and pH.

Walker River, Nevada, is affected by iron and is listed as impaired by the US EPA for total suspended solids.

The **Upper East Walker River** is the section above the Bridgeport Reservoir and the town of Bridgeport. The California State Water Resource Control Board has listed the river as impaired for pathogens, while the US EPA has found the Upper East Walker impacted by nickel and impaired for swimming, drinking, fishing, recreation, wildlife habitat, fish tissue, flow alterations and freshwater habitat.. Probable sources for the above impacts are: highway, road and bridge runoff; wastewater disposal; grazing or feeding in riparian areas; ag/nurseries; spills; stream bank modification and upstream impoundment; urban runoff and storm sewers; construction; leaking underground tanks; and atmospheric deposition.

The **Lower East Walker River** is the section below Bridgeport reservoir. It is impacted by silver and other metals and is listed by the US EPA as impaired for nutrients (unionized ammonia, nitrogen and phosphorous), pathogens, swimming, recreational use, non-native species (noxious aquatic weeds), wildlife habitat, pH, flow alterations and freshwater habitat and threatened for drinking, fishing and fish tissue. In addition, the California State Water Resources Control Board has listed the Lower East Walker as impaired for sediment/siltation. The probable sources for these listings are: highway, road and bridge runoff; abandoned mines; wastewater disposal; agriculture and unmanaged grazing or feeding; mill tailings; urban high density, construction and municipal point source pollution; truck or train spills; upstream impoundment; urban runoff and storm sewers; and golf course activities.

East Walker, Nevada, is impacted by iron and has been listed by the US EPA as impaired for nutrients, temperature, pH and total suspended solids (TSS).

Bridgeport Reservoir is affected by unspecified metals and has been listed by the US EPA as impaired for nutrients (causing harmful algal blooms), swimming, recreation, non-native species, sediment/siltation, wildlife habitat and freshwater habitat. The reservoir is also listed by the California State Water Board as impaired for flow alterations. Probable sources of these impacts are nonpoint source pollution, agriculture, grazing, hydromodification and natural sources.

Bodie Creek, a tributary to the East Walker, is impacted by unspecified metals and has been listed as impaired for pathogens, fishing, threatened and endangered species, wildlife habitat, fish tissue and freshwater habitat by the US EPA. The California State Water Board has also listed Bodie Creek as threatened for sediment/siltation, probable sources for these impacts include upland and riparian agriculture and grazing; spills, surface mining and tailings; urban runoff and storm sewer; and agricultural and irrigation tail waters.

Other tributaries and reservoirs in the Walker drainage basin have been listed as threatened or impaired. **Aurora Canyon Creek** is impacted by mercury and has been listed as impaired for nutrients, recreation use, habitat, sediment/siltation and freshwater habitat by the US EPA. This creek is also listed by the US EPA as threatened for fishing and fish tissue, probable sources for the impacts incluse mill tailings, agriculture, resource extraction and rangeland grazing. **Clark Canyon Creek** has been listed as impaired by the US EPA for recreation, wildlife habitat, sediment/siltation and freshwater habitat, most likely because of agricultural and rangeland practices in the watershed. **Clearwater Creek** is impacted by unspecified metals and has been listed by the US EPA as impaired for recreation use, habitat, sediment/siltation and freshwater habitat. Probable sources include agriculture, natural sources, rangeland, and highway/road runoff. **Green Creek** has been listed as impaired for nutrients, fishing, recreation use, threatened and endangered species, fish tissue, and flow alterations by the US EPA and for wildlife and freshwater habitat by the California State Water Resource Control Board. Probable sources are range grazing, agriculture, atmospheric deposition, recreational uses, highway/road runoff and hydromodification. **Hot Springs Canyon Creek** has been listed as impaired by the US EPA for recreation use, habitat, sediment/siltation and freshwater habitat. Probable source is rangeland activity. **Robinson Creek** has been listed as impaired by the US EPA for nutrients, swimming, drinking, recreation, threatened and endangered species, habitat, sediment/siltation, flow alterations and freshwater habitat and by the California State Water Resource Control Board for pathogens. Probable sources include pasture grazing, onsite wastewater treatment, recreational and tourism activities and natural sources. **Rough Creek** has been listed as impaired by the US EPA for recreation, threatened and endangered species and sediment/siltation and by the California State Water Resource Control Board for wildlife and freshwater habitat. Pprobable sources are upland and riparian grazing. **Swauger Creek** has been listed as impaired by the US EPA for swimming, drinking, threatened and endangered species, wildlife habitat, wetland habitat and freshwater habitat and as impaired for nutrients and pathogens by the California State Water Board. Probable sources include range grazing, onsite wastewater treatment, and highway runoff. **Topaz Lake** is affected by arsenic, manganese and other metals and has been listed as impaired by the US EPA for swimming, recreation, threatened and endangered species, habitat, groundwater, wetland habitat, and freshwater habitat and by the California State Water Quality Control Board as impaired for sediment and siltation. Probable sources are agriculture, stream bank modification and erosion, non-point source pollution and natural sources.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

WALKER	West Walker	Upper East Walker	Lower East Walker	Bridgeport Reservoir	Bodie Creek
Metals	X		X	X	X
Arsenic	X				
Cadmium					
Copper	X				
Manganese	X				
Nickel		X			
Silver			X		
Nutrients	I		I	I	
Pathogens		I	I		I
Pesticides					
PCBs/ Arochlor					

Human Exposure

WALKER	West Walker	Upper East Walker	Lower East Walker	Bridgeport Reservoir	Bodie Creek
Swimmable	I	I	I	I	
Drinkable	I	I	T		
Fishable		I	T		I
Recreation User Days	I	I	I	I	

Species

WALKER	West Walker	Upper East Walker	Lower East Walker	Bridgeport Reservoir	Bodie Creek
TES species					I
% Non-native			I	I	
Habitat	I	I	I	I	I

Physical Chemistry

WALKER	West Walker	Upper East Walker	Lower East Walker	Bridgeport Reservoir	Bodie Creek
pH			I		
Sediment/ Siltation	I		I	I	I
Tissue		I	T		I

Who's Working in the Walker River Watershed

Mono County Watershed Group

Contact: Greg Newbry, Senior Planner

Address: PO Box 347, Mammoth Lakes, CA 93546

Phone: 760.924.1811

Fax: 760 924 1801

Email: gnewbry@msn.com

Mono County worked with the county Collaborative Planning Team (CPT) successfully and received two Prop 13 grants enabling an effort towards the creation of watershed management plans. The CPT is an active body representing most of the state, federal and local agencies in Mono County. The purposes of the grants are to develop watershed management plans for three of the principal watersheds of Mono County: Upper Owens River Basin, Mono Basin and the West Walker basin. For each basin, the watershed management plans will be developed with input from a watershed council of landowners, agencies, and other local stakeholders, and will be based on an assessment of watershed conditions.

Assessments Completed in the Walker River Watershed

Mercury in the Walker River Basin, Nevada and California—Sources, Distribution, and Potential Effects on the Ecosystem

Authors: Ralph L. Seiler, Michael S. Lico, Stanley N. Wiemeyer, and David C. Evers
Publisher: US Geological Survey
Location: http://water.usgs.gov/pubs/sir/2004/5147/sir2004-5147.pdf

Yuba River Watershed

The Yuba River watershed encompasses approximately 1,300 square miles in the northwestern Sierra Nevada. The Upper Yuba is composed of three forks – the North, Middle and South. The North fork is the largest by volume, and the 39 miles of the South Yuba have been protected under the State Wild and Scenic program. After all three forks converge, the river is impounded by Englebright Dam. Englebright Dam is the uppermost barrier to spawning salmon and steelhead. CALFED is evaluating programs to reintroduce salmon and steelhead to upstream areas by removing dams. The removal of Daguerre Point Dam, a likely possibility, would add 12 miles of prime spawning habitat. The removal of Englebright would reintroduce over 50 miles of salmon and steelhead habitat.

State of the Yuba River Watershed Summary

The **North Fork Yuba River** is impacted by mercury and is listed by the US EPA as impaired for pathogens, wildlife habitat and freshwater habitat. Probable sources of the impairments are pland grazing and other unknown sources.

The **Middle Fork Yuba River** is affected by mercury and is listed by the US EPA as impaired for pathogens ,wildlife habitat and freshwater habitat. Probable sources are resource extraction, agriculture, upland grazing and other unknown sources.

The **Upper South Fork Yuba River**, above Edwards Crossing, has been listed by the US EPA as impaired for pathogens, wildlife habitat and freshwater habitat and as threatened for swimming and recreational day use. The California Office of Environmental Health Hazard Assessment has listed the river as impaired for fishing and fish tissue due to fish consumption advisories for trout. The **Lower South Fork Yuba**, below Edwards Crossing, is affected by mercury and has been listed by the US EPA as impaired for pathogens, wildlife habitat and freshwater habitat and threatened for swimming and recreation user days. The river has also been listed as impaired by NOAA for native status and threatened and endangered species due to impacts on critical habitat for spring-run Chinook salmon. Probable sources for the above habitat impacts are upland grazing and other unknown sources.

Englebright Reservoir is affected by mercury and is listed by the US EPA as impaired for swimming, drinking, fishing, recreation use, habitat, sediment/silt and freshwater habitat. The California Office of Environmental Health Hazard Assessment has also listed the reservoir as impaired for fish tissue due to a fish consumption advisory due to impairment . The probable source for these impairments is resource extraction.

Humbug Creek is affected by metals including copper, mercury and zinc and has been listed as impaired for habitat, sediment/siltation and freshwater habitat and as threatened for swimming and recreation use by the US EPA. The probable cause for these impairments is historical resource extraction.

Kanaka Creek is affected by arsenic and other unspecified metals. It is also listed by the US EPA as impaired for drinking, wildlife habitat and freshwater habitat. The probable source for these listings is resource extraction.

Other reservoirs in the in the Yuba Watershed have been listed as either threatened or impaired. **Bullards Bar Reservoir** has been listed by the US EPA as impaired for sediment/siltation and as threatened for swimming,

drinking water, fishing, recreational day use, habitat, fish tissue and fresh water habitat. **Camp Far West Reservoir** is impacted by mercury and has been listed by the US EPA as impared for swimming, habitat, sediment/siltation and freshwater habitat. OEHHA has also listed the reservoir as impaired for fishing and fish tissue – inclusing fish consumption advisories regarding bass and catfish. The California Office of Environmental Health Hazard Assessment has issued a fish consumption advisory. The probable source for these listings is resource extraction. **Scotts Flat Reservoir** is affected by mercury and has been listed as impaired by the US EPA for swimming and wildlife, wetland and freshwater habitat. The California Office of Environmental Health Hazard Assessment has also listed the reservoir as impaired for fishing and fish tissue due to fish consumption advisories. Resource extraction is listed as the probably cause for these concerns. Like other reservoirs in this watershed, **Combie Reservoir** is impacted by mercury. It has also been listed as impaired by the US EPA for threatened and endangered species, habitat, sediment/siltation and freshwater habitat. The California Office of Environmental Health Hazard Assessment lists the reservoir as impaired for fishing and fish tissue due to fish consumption advisories regarding bass and catfish. Resource extraction is the probable source of these listings. **Rollins Reservoir** is affected by mercury and has been listed by the US EPA as impaired for swimming, recreation, wildlife habitat and freshwater habitat. OEHHA has also listed the reservoir as impaired for fishing and fish tissue due to fish consumption advisories. The Probably cause for these impairments is resource extraction.

Other creeks that have been listed as impaired or threatened in the Yuba watershed are as follows. The **Lower Bear River** is affected by unspecified metals and has been listed by the US EPA as impaired for wildlife and freshwater habitat and by the State Water Resources Control Board as impaired for pesticides (diazinon). In addition, the California Office of Environmental Health Hazard Assessment (OEHHA) has listed the Lower Bear as impaired for fishing and fish tissue. Probable sources for these listings are related to agriculture. The **Upper Bear River** is affected by mercury and has been listed by the US EPA as impaired for fishing, habitat, fish tissue, wetland and freshwater habitat, most likely due to historic resource extraction. **Deer Creek** has been listed as impaired for habitat, pH and freshwater habitat by the US EPA. The probable source for these impairments is changes in the ordinary stratification. **Little Deer Creek** is affected by mercury and has been listed by the US EPA as impaired for swimming as well as for wildlife, wetland and freshwater habitat. OEHHA has also listed the creek as impaired for fishing and fish tissue due to fish consumption advisories regarding troutThe probable source for these impairments is historical resource extraction. **Wolf Creek** has been listed by the UP EPA as impaired for swimming, recreation use, threatened and endangered species, habitat, groundwater, wetland habitat and freshwater habitat. It is also listed by the California State Water Resources Control Board for pathogens.

I = Impaired: not supporting a specific designated use

T = Threatened: currently supporting designated uses, but one or more of those uses may become impaired in the future if pollution control actions are not taken

X = water body is impacted by a particular metal

Introduced and Naturally Occurring Chemicals

YUBA	North Yuba	Middle Yuba	South Yuba	Englebright Reservoir	Humbug Creek	Kanaka Creek
Metals					X	X
Arsenic					X	X
Copper						
Mercury	X	X	X	X	X	
Zinc					X	
Pathogens	I	I	I			

Human Exposure

YUBA	North Yuba	Middle Yuba	South Yuba	Englebright Reservoir	Humbug Creek	Kanaka Creek
Swimmable			T	I	T	
Drinkable				I		I
Fishable			I	I		
Recreation User Days			T	I	T	

Species

YUBA	North Yuba	Middle Yuba	South Yuba	Englebright Reservoir	Humbug Creek	Kanaka Creek
Native status			T			
TES Species			T			
Habitat	I	I	I	I	I	I
Fishery						

Physical Chemistry

YUBA	North Yuba	Middle Yuba	South Yuba	Englebright Reservoir	Humbug Creek	Kanaka Creek
Sediment/Siltation				I	I	
Tissue			I	I		

Who's Working in the Yuba River Watershed

Cherokee Watershed Alliance

Contact: Susan St Germaine, Coordinator

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Phone: 530.893.9039

Fax: 530.893.5903

Email: susansgm@saber.net

The Cherokee Watershed Alliance is a collaborative, non-regulatory effort that involves the participation of various social, economic, and environmental interests, both private and public, working together to achieve the enhancement of water quality and aquatic habitat in the Cherokee Watershed. The mission of the Cherokee Watershed Alliance is to foster partnerships that will contribute to the integrated long-term cultural, economic, and environmental health of the watershed through active community participation. The area is a place of natural beauty with rangeland, forest, mining, agricultural productivity, and environmental integrity whose stakeholders strive to integrate cultural, economic, and environmental health.

Friends of Deer Creek (FODC)

Contact: John van der Veen

Address: 132 Main St., Nevada City, CA 95959

Phone: 530.265.6090

Fax: 530.265.3170

Email: friendsofdc@sbcglobal.net

Web: www.friendsofdeercreek.org

Friends of Deer Creek (FoDC) is comprised of 50 volunteers doing water monitoring and 30-40 volunteers doing restoration. Stakeholders are landowners, businesses, public agencies and community members. Projects include monitoring, restoration, native plant restorations, storm drain measures of sediment load, and algal biomass measurements to resolve fish kills due to high water pH. FoDC incorporated in 1999. The group obtained Prop 204 funding early in 2000 to do baseline water quality monitoring, restore a segment of channelized creek, do storm water studies in Nevada City, and assist the local stakeholders in developing a Coordinated Resource Management Plan for the watershed.

South Yuba River Citizens League (SYRCL)

Contact: Jason Rainey, Executive Director

Address: 216 Main Street, Nevada City, CA 95959

Phone: 530.265.5961

Fax: 530.265.6232

Email: jason@syrcl.org

Web: www.syrcl.org/

The South Yuba River Citizens League is a community-based educational nonprofit corporation committed to the protection, preservation and restoration of the entire Yuba Watershed. SYRCL works to fulfill its mission by aggressively seeking environmental solutions through the tools of education, organization, collaboration, litigation and legislation. SYRCL successes include: permanent protection of the South Yuba from all future dam proposals, stopped 7 proposed dams and hydro projects, lead efforts to restore salmon and steelhead to the upper reaches by spearheading investigations of dam removal or modification, implementing a model citizen-based river monitoring program, hosting river clean-ups, salmon watches, legislative days, educational forums, dances, and rallies.

Wolf Creek Community Alliance

Contact: Jonathan Keehn, Program Coordinator

Address: PO Box 477, Grass Valley, CA 95945

Phone: 530.272.2347

Email: wolf@WolfCreekAlliance.org

Web: www.WolfCreekAlliance.org

Wolf Creek Community Alliance is a local volunteer organization whose primary mission is to preserve and restore Wolf Creek, its tributaries, and watershed. Wolf Creek, at the heart of Grass Valley, is a priceless but neglected resource that we are in danger of losing. Joining with individuals, neighborhood groups, schools, civic organizations, businesses, park districts, conservation groups, and local governments to accomplish the following goals: educate the general public about the aesthetic, recreational, economic, and ecological value a natural stream offers; perform hands-on clean-up and restoration work; seek funds to implement restoration

projects that will make our creek an urban oasis; improve the quality of life for residents through community involvement and pride in our Wolf Creek Watershed.

Yuba Watershed Council

Contact: Lynn Campbell, Coordinator

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Email: ywc@sbcglobal.net

Web: www.yubawatershedcouncil.org

The Yuba Watershed Council works to protect the Yuba and Bear River watersheds and tributaries. The Yuba Watershed Council is a community forum of diverse stakeholders which is taking the initiative to: 1) Better appreciate the complex watershed relationships in the Yuba and Bear watersheds and their environments; 2) Protect, restore and enhance watershed resources where needed; and 3) Maintain a sustainable watershed resource base for future generations. Stakeholders include local, state, and federal agencies, conservation and environmental organizations, and neighborhood associations.

Assessments Completed in the Yuba River Watershed

South Yuba River Citizens League Monitoring data reports

Author: South Yuba River Citizens League

Location: www.syrcl.org

Deer Creek Coordinated Resource Management Plan

Author: Friends of Deer Creek

Location: www.friendsofdeercreek.org/

Note: plan includes information on Water Quality & Monitoring, Water Flow in the Deer Creek Watershed, Septic & Wastewater Treatment, Soils and Fire, Vegetation Ecology and Vegetation Management, Recreation, Population, Society & Economics, Regulatory and Jurisdictional Issues, Disturbance Inventory.

Watershed Scale-Analysis and Land-Use Planning in the Sierra Nevada: Roads in the Yuba River Basin

Author: Yuba Watershed Council

Location: http://snepmaps.des.ucdavis.edu/snner/yuba/prep-maps/ISEH-posterweb_main-menu.htm

Appendix B:

Major Dams, Reservoirs & Diversions in the Sierra

SIERRA WATERSHED	DAMS/RESERVOIRS/DIVERSIONS	FEDERAL	STATE	LOCAL
Eagle Lake				
Honey Lake				
Upper Sacramento	Shasta Dam & Reservoir	X		
	Corning Canal	X		
	Tehama/Colusa Canal	X		
	Box Canyon Dam & Reservoir			X
Feather	Antelope Lake Dam & Reservoir		X	
	Lake Davis Dam & Reservoir		X	
	Frenchman Lake Dam & Reservoir		X	
	Oroville Dam & Reservoir		X	
	Mountain Meadows Dam & Reservoir			X
	Lake Almanor Dam & Reservoir			X
	Butt Valley Dam & Reservoir			X
	Bucks Lake Dam & Reservoir			X
	Paradise Dam & Reservoir			X
	Little Grass Valley Dam & Reservoir			X
	Sly Creek Dam & Reservoir			X
	Lake Wyandotte Dam & Reservoir			X
Yuba	Englebright Dam & Reservoir	X		
	Jackson Meadows Dam & Reservoir			X
	Bowman Lake Dam & Reservoir			X
	Spaulding Dam & Reservoir			X
	New Bullards Bar Dam & Reservoir			X
	Upper and Lower Scotts Flat Dams & Reservoirs			X
	Rollins Dam & Reservoir			X
	Camp Far West Dam & Reservoir			X
American	Folsom Dam & Reservoir	X		
	Nimbus Dam	X		
	Folsom S Canal	X		
	Sugar Pine Dam & Reservoir			X
	French Meadows Dam & Reservoir			X
	Hell-Hole Dam & Reservoir			X
	Loon Lake Dam & Reservoir			X
	Stumpy Meadow Dam & Reservoir			X
	Union Valley Dam & Reservoir			X
	Ice House Dam & Reservoir			X
	Chili Bar Dam & Reservoir			X

SIERRA WATERSHED CONT.	DAMS/RESERVOIRS/DIVERSIONS CONT.	FEDERAL CONT.	STATE CONT.	LOCAL CONT.
Cosumnes	Jenkinson Lake Dam & Reservoir	X		
Mokelumne	Silver Lake Dam & Reservoir			X
	Lower Bear Lake Dam & Reservoir			X
	Salt Spring Dam & Reservoir			X
	Pardee Dam & Reservoir			X
	Camanche Dam & Reservoir			X
	Mokelumne Aqueduct			X
Calaveras	New Hogan Dam & Reservoir	X		
Stanislaus	New Melones Dam & Reservoir	X		
	Spicer Meadow Dam & Reservoir			
	Donnells Dam & Reservoir			X
	Beardsley Lake Dam & Reservoir			X
	Lyons Dam & Reservoir			X
	Tulloch Dam & Reservoir			X
Tuolumne	Lake Lloyd Dam & Reservoir			X
	Lake Eleanor Dam & Reservoir			X
	Hetch Hetchy Dam & Reservoir			X
	Hetch Hetchy Aqueduct			X
	New Don Pedro Dam & Reservoir			X
Merced	New Exchequer Dam & Lake McClure Reservoir			X
San Joaquin	Eastman Lake Dam & Reservoir (Chowchilla River)	X		
	Hensley Lake Dam & Reservoir (Fresno River)	X		
	Friant Dam & Millerton Reservoir	X		
	Madera Canal	X		
	Thomas A. Edison Lake Dam & Reservoir			X
	Florence Lake Dam & Reservoir			X
	Mammoth Pool Dam & Reservoir			X
	Huntington Lake Dam & Reservoir			X
	Shaver Lake Dam & Reservoir			X
	Bass Lake Dam & Reservoir			X
Kings	Pine Flat Dam & Reservoir	X		
	Friant-Kern Canal	X		
	Courtright Dam & Reservoir			X
	Wishon Dam & Reservoir			X
Kaweah	Lake Kaweah Dam & Reservoir	X		
Tule	Lake Success Dam & Reservoir	X		
Kern	Lake Isabella Dam & Reservoir	X		
	Kern Water Bank (underground storage)		X	
Caliente				
Mojave	Mojave River Dam & Reservoir	X		

SIERRA WATERSHED CONT.	DAMS/RESERVOIRS/DIVERSIONS CONT.	FEDERAL CONT.	STATE CONT.	LOCAL CONT.
Truckee	Stampede Dam & Reservoir	X		X
	Prosser Creek Dam & Reservoir	X		X
	Martis Creek Dam & Reservoir	X		
	Boca Dam & Reservoir	X		X
	Lake Tahoe Dam	X		X
	Donner Lake Dam			X
	Independence Lake Dam			X
	Floriston Diversion Dam			X
Carson	Diamond Valley Irrigation Ditches			X
	15 small reservoirs of 500 acre-ft or less capacity			X
	Heenan Lake			X
Walker	Bridgeport Reservoir	X		X
	Topaz Reservoir Diversion Canal			X
	Topaz Reservoir	X		X
	Poore Lake/Reservoir			X
	Upper Twin Lake Reservoir			X
	Lower Twin Lake Reservoir			X
	3 small reservoirs of 500 acre-ft or less capacity			X
	Various irrigation diversion ditches			X
Mono Basin	Lee Vining Intake and Tunnel			X
	Grant Lake Dam & Reservoir			X
Owens	Lake Crowley Dam & Reservoir			X
	Pleasant Valley Dam, Reservoir & Power Plants			X
	Lake Sabrina Dam & Reservoir			X
	South Lake Dam & Reservoir			X
	Tinemaha Dam & Reservoir			X
	Los Angeles Aqueduct			X
	No. and So. Haiwee Dams & Reservoirs			X
	Haiwee Power Plant			X

Appendix C:

Glossary of Terms

Aquifer—An underground layer of rock, gravel, or sediment containing water. An aquifer may be confined between two impervious surfaces, or it may be unconfined.

Best Management Practices (BMPs)—Regulatory or voluntary procedures that can reduce the threat to water supplies posed by normal activities in homes, businesses, or farms.

Emerging Contaminants—Diseases or chemicals that either are new to the environment or have been recently identified as potential health threats.

Dissolved solids—Amount of minerals, such as salt, that are dissolved in water; amount of dissolved solids is an indicator of salinity or hardness. (USGS)

Endemic found only in a particular place, such as the Sierra Nevada region, and not in any other parts of the state.

Legacy impacts are impacts from early development in the 1800s and early 1900s, such as mining, logging, construction of the transcontinental railroad, etc., that still affect us today.

Nitrate—An ion consisting of nitrogen and oxygen (NO3-). Nitrate is a plant nutrient and is very mobile in soils. (USGS)

Non-native species are those that have been introduced to the region from somewhere else; they are not native to the Sierra Nevada.

Nonpoint Source Pollution—Pollution that occurs when surface water runoff from rainfall or snowmelt moves across or into the ground, picking up pollutants and carrying them into streams, lakes, wetlands, or groundwater.

Nutrient—An element or compound essential for animal and plant growth. Common nutrients in fertilizer include nitrogen, phosphorus, and potassium. (USGS)

Pathogen—Any microbiological agent capable of producing disease in healthy peoples, plants or animals.

Phosphorus—A nutrient essential for growth that can play a key role in stimulating aquatic growth in lakes and streams. (USGS)

Physical, Chemical and Biological Monitoring—Three measurable components of water quality monitoring: Physical measurements may include temperature, flow, water color, and the condition of streambanks and lakeshores. Dissolved oxygen, suspended sediments, nutrients, metals, oils, and pesticides are examples of chemical measurements. The abundance and variety of aquatic plant and animal life are biological measurements.

Point Source Pollution—Pollution from a distinct, identifiable source, such as a feedlot or factory.

Polychlorinated biphenyls (PCBs)—A mixture of chlorinated derivatives of biphenyl, marketed under the trade name Aroclor with a number designating the chlorine content (such as Aroclor 1260). PCBs were used in transformers and capacitors for insulating purposes and in gas pipeline systems as a lubricant. Further sale for new use was banned by law in 1979. (USGS)

Riparian habitat is made up of the areas adjacent to streams, lakes and other wet areas necessary for their immediate survival.

Riparian Zones—Vegetated areas abutting lakes, rivers, and streams that function as filters for polluted runoff, stabilize banks and channels, and provide habitat for fish and wildlife.

Semivolatile organic compound (SVOC)—Operationally defined as a group of synthetic organic compounds that are solvent-extractable and that can be determined by gas chromatography/mass spectrometry. SVOCs include phenols, phthalates, and polycyclic aromatic hydrocarbons (PAHs) (USGS)

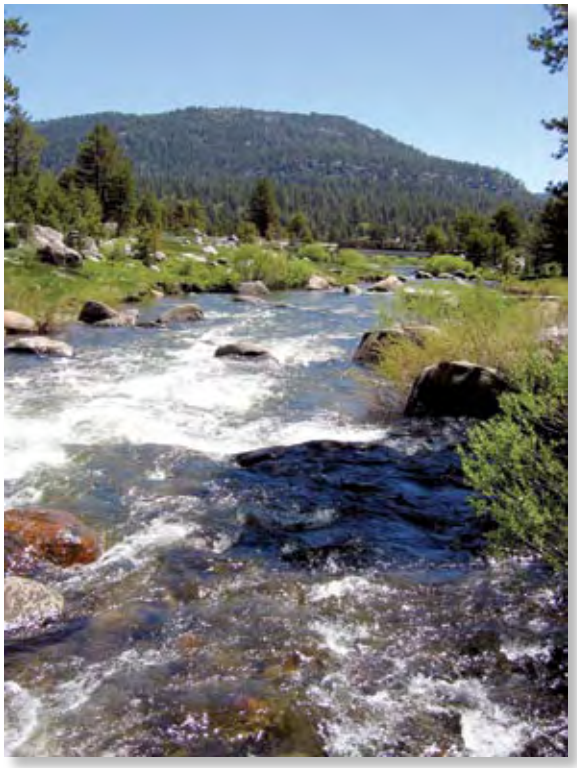
Suspended sediment—Particles of rock, sand, soil, and organic detritus carried in suspension in the water column, in contrast to sediment that moves on or near the streambed. (USGS)

Terrestrial vertebrates are land-based creatures, including birds, mammals, reptiles and amphibians.

Total Maximum Daily Load (TMDL)—The amount of a particular pollutant that a stream, lake, estuary, or other body of water can contain without violating state water quality standards.

Volatile organic compounds (VOCs)—Organic chemicals that have a high vapor pressure relative to their water solubility. VOCs include components of gasoline, fuel oils, and lubricants, as well as organic solvents, fumigants, some inert ingredients in pesticides, and some by-products of chlorine disinfection. (USGS)

Watershed—an area of land and water that captures precipitation and funnels it into a particular body of water, such as a stream, river or lake. Watersheds come in all sizes, with smaller watersheds combining to create larger ones.



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