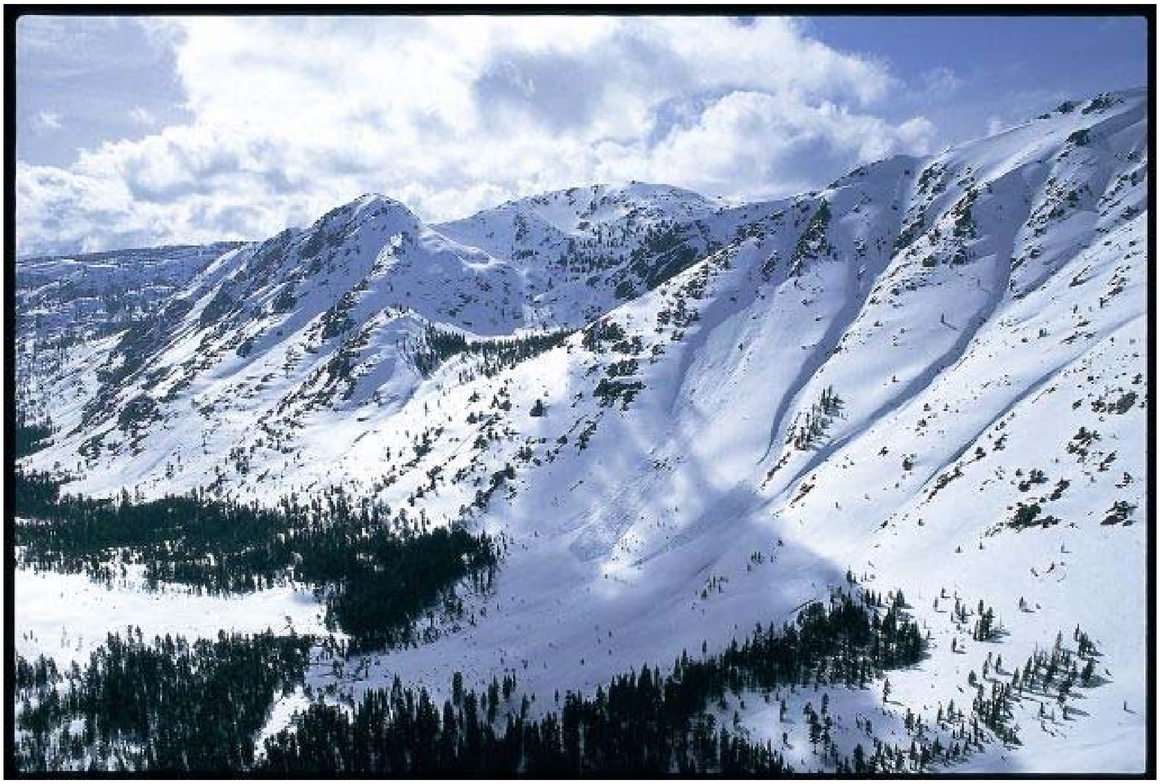

Mokelumne River
Watershed Sanitary Survey
2005 Update

East Bay Municipal Utility District
January 2006

Mokelumne River Watershed Sanitary Survey
2005 Update

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Background

The California Department of Health Services (CDHS) requires that all surface water systems conduct a watershed sanitary survey by January 1, 1996, to be supplemented by updates every five years thereafter. The purpose of a watershed sanitary survey is to assess a system's ability of meet the United States Environmental Protection Agency's (USEPA) Surface Water Treatment Rule (SWTR) later superceded by the Interim Enhanced SWTR (IESWTR) for large systems and the Long Term 1 Enhanced SWTR for water small systems. This assessment is performed through a detailed evaluation water quality data, treatment facilities, and watershed conditions. The East Bay Municipal Utility District (District) submitted the first Mokelumne River Watershed Sanitary Survey (1995 MRWSS) to CDHS in December 1995, followed by a five-year update in December 2000 (MRWSS Update 2000). The document herein is the District's second five-year update of the original watershed sanitary survey.

This 2005 Year Update of the Mokelumne River Watershed Sanitary Survey (MRWSS Update 2005) covers the lands that drain to the District's Pardee and Camanche Reservoirs. The portions of the Mokelumne River watershed that drain to Pardee Reservoir - from the North Fork, Middle Fork, South Fork, and main-stem of the Mokelumne River - constitute the Upper Mokelumne River Watershed. The Camanche Watershed consists of the lands between Pardee and Camanche Dams that drain to Camanche Reservoir. Together, these two watersheds cover 627 square miles located along the Upper Mokelumne River in the Sierra-Nevada foothill counties of Alpine, Amador, San Joaquin and Calaveras.

Water Quality Conditions

Pardee and Camanche Reservoirs exhibit excellent raw water quality characteristics. The raw waters met the primary treated water MCLs for all general physical (excluding turbidity), general mineral (excluding aluminum for both Pardee and Camanche, and antimony and thallium for Camanche), inorganics, organics and radionuclide parameters. The raw water turbidity and total coliform levels were above the treated water MCLs that is expected. For Pardee Reservoir iron was detected at concentrations above the secondary standard. For Camanche Reservoir, both iron and manganese were detected in the raw water at concentrations above the corresponding secondary standards. Secondary standards are primarily concerned with taste or appearance of water rather than public health concerns.

There were no Synthetic Organic Carbons (SOCs) detected at concentrations above primary treated water MCLs in either of these two reservoirs. In Pardee and Camanche Reservoirs, the water quality monitoring data indicated that MTBE concentrations declined to trace levels after the District initiated a program that required all District-owned and concessionaire-owned 2-stroke high emission engines be replaced with 4-stroke low emission engines. Additionally, all fuel sold at the Pardee Marina beginning in 1999 was MTBE-free.

The District's Water Treatment Plants -- Pardee Center, Pardee Recreation Area, Camanche North Shore, Camanche South Shore, Walnut Creek, Lafayette, and Orinda Water Treatment Plants (WTPs) -- are very effective and reliable at removing particulates and microorganisms. The monthly WTP reports, annual water quality reports, and annual inspection reports submitted to CDHS indicate that the treated or finished waters from these WTPs met all treated water quality regulations.

In addition, disinfection residual and microbiological data from the District's distribution systems (as stated in the monthly WTP reports) showed that the District had no problems meeting the detectable disinfectant residual criteria of the SWTR and the turbidity removal requirement in the IESWTR. It is expected that the District will be able to meet the recently promulgated *Cryptosporidium* inactivation requirements as defined in the Long-Term 2 Enhanced SWTR. With regards to the Stage 1 - DBP Rule, the source water total organic carbon (TOC) concentrations in both Pardee and Camanche Reservoirs (median TOC values of 1.6 mg/L and 1.5 mg/L, respectively) indicate that the District was not be required to pursue enhanced coagulation at any of the water treatment plants treating these source waters.

Water Treatment Facilities

The District operates a total of seven water treatment plants (WTPs) -- three large systems and four small systems -- that treat water from Pardee or Camanche Reservoirs. The three large systems (serving over 10,000 people each) are the Walnut Creek, Orinda, and Lafayette WTPs located in the District's East Bay service area. These facilities treat Mokelumne River water that is stored in Pardee Reservoir and transported through the Mokelumne Aqueducts. Improvements to Walnut Creek WTP during the 2000-2004 update period include the addition of 2 filters (increasing maximum production rate to from 80 to 120 MGD) and upgrades for chemical systems, instrumentation, waste stream treatment, and seismic safety.

The four small systems (serving less than 10,000 people each) are the Pardee Recreation Area, Pardee Center, Camanche South Shore, and Camanche North Shore WTPs. Pardee Recreation Area and Pardee Center WTPs treat water from Pardee Reservoir. Camanche South Shore WTP treats Camanche Reservoir water. Camanche North Shore WTP treats groundwater from three wells. In 2005, the greensand filters in Camanche North Shore WTP were replaced with pyrolucite filters.

Watershed Conditions

Evaluation of watershed conditions is organized into four sections in the MRWSS Update 2005: Section 2: Water Supply, Conveyance, and Treatment Systems, Section 3: Watershed Description, Section 5: Potential Contaminant Sources, and Section 6: Watershed Management and Control. Each of these sections is briefly summarized below.

Water Supply, Conveyance, and Treatment Systems: Summary

During the 2000-2004 period, re-licensing of Federal Energy Regulatory Commission (FERC) Project 137 was completed. FERC Project 137 consists of PG&E facilities on the North Fork of the Mokelumne River (e.g. Salt Springs Reservoir, powerhouses at Tiger Creek and Electra) that control a large portion of the flow into Pardee Reservoir. Under the new license, several dams in the upper tributaries were removed and new release requirements were imposed for ecosystem and recreation flows.

Also on the North Fork of the Mokelumne, Amador Water Agency has built a new 2 MGD Buckhorn WTP, and is replacing the Amador Canal with a 30" pipe. In the Middle Fork of the

Mokelumne River, Calaveras County Water District upgraded the West Point WTP to service up to 900 homes.

Pardee Reservoir filled to within one foot of its spillway each year from 2000 to 2004, despite below average runoff for the update period. Filling Pardee Reservoir maximizes water supply and late-season cold water releases that benefit fish in the Mokelumne River. Pardee Reservoir spilled in only one month (June 2003) during the update period, compared with 18 months during the 1995-1999 period. No interruptions in Mokelumne Aqueduct flows were experienced. Camanche Reservoir had no spills, and storage dropped as low as 47% of capacity in 2001.

Updates to WTPs are described above in "*Water Treatment Facilities*"

Watershed Description: Summary

Average true natural flow (TNF) at the Mokelumne Hill gaging station was 77% of the historic average for the update period. This contrasts sharply with the previous 1995-1999 update period when all years had above-average TNF volumes, and one year (1995) had double the historic average.

Land use and ownership were re-evaluated using newly available data sets. Population figures were also updated using 2000 Census data and more current projections. Amador and Calaveras County growth rates over the 1990-2000 decade were 14% and 26% respectively, which lagged behind growth in excess of 50% experienced from 1980-1990. Current growth projections are around 4% per year according to the Environmental Scan White Paper on Upcountry Growth. No updates were made to descriptions of watershed geology, soils, or vegetation and wildlife for Pardee and Camanche Watershed.

Potential Contaminant Sources: Summary

Contaminant sources in the watershed with the highest potential impact on water quality have been identified as the following: fire and fuels management, geologic hazards, grazing, EBMUD facilities, recreation, mines, and logging. Three contaminant sources (transportation corridors, illegal dumping, and agriculture) are considered to have insignificant to low potential impact on water quality. Table 5-24 in Section 5 contains a summary of the potential threats and water quality parameters impacted for all fourteen contaminant source categories.

In terms of potential threats to water quality, the most significant event during the update period was the October 2004 Power Fire, followed by rural area runoff and sanitation facilities. Over 16,000 acres were burned in the North Fork of the Mokelumne River, about 30 miles upstream of Pardee Reservoir in national forest, Sierra Pacific Industries and PG&E lands. Sediment loading and concentrations of inorganics increased dramatically in the local tributaries in the burned area. However, post-fire sampling by the District showed that concentrations were diluted to within normal background levels at the Highway 49 Bridge, two miles upstream of Pardee Reservoir. The Forest Service is currently implementing burned-area treatments on about half of the affected area.

The District owns and manages lands around its reservoirs that make up about 4% of the total Pardee and Camanche Watershed. During the update period, approximately 700 additional acres around

Pardee Reservoir were added to this total, though 338 acres were acquired in conservation easements (not owned property). District facilities that have potential impacts to water quality include wastewater collection and treatment systems, recreation areas, and grazed areas. The District's wastewater treatment and collection systems have undergone improvements during the update period, and a database for prioritizing preventive maintenance has been developed. Sewage overflows that occurred near Camanche Reservoir were successfully contained and remediated. Recreation on District lands is increasing, as evidenced by the construction of a new boating take-out facility on the Middle Bar Bridge upstream of Pardee Reservoir, and rising annual visitor counts at Camanche North and South Shore areas. The District continues to use range management for fire prevention and control of grassland and brushland habitat. Annual grazing plans for each pasture are developed to determine allowable stocking levels and residual dry matter to be retained to minimize erosion.

In the non-District watershed lands above Pardee Reservoir, the majority of urban development is occurring in the City of Jackson and in communities along Highway 88. Several subdivisions of 100+ units are planned or are being built, increasing the potential for contamination by urban runoff, especially during construction. Logging continues to be a major activity in the watersheds, with timber harvest plans totaling over 63 thousand acres in the past 10-year period. Further upstream, on Eldorado and Stanislaus National Forest Lands, timber sales, fuels management projects, and grazing have decreased during the update timeframe, largely under the direction of a new Sierra Nevada Forest Plan Amendment. On both public and private lands in the upper watershed, erosion from off-highway vehicle (OHV) use is a growing concern that is resisting efforts for curtailment.

Other contaminant sources have decreased potential to impact water quality. For example, several documented leaking underground storage tanks (USTs) have undergone remediation during this update period, and pesticide use is trending toward more environmentally friendly compounds and integrated pest management practices. GIS data sets for nearly all contaminant sources (e.g. septic tanks, fires, USTs, urban areas) are growing and improving, especially within the District, county governments, and the Forest Service. The GIS framework facilitates sharing of information among agencies in the watershed, and improves our ability to track, quantify, and analyze potential contaminant sources.

Watershed Management and Control: Summary

Management practices by the District, Calaveras and Amador Counties, Stanislaus and Eldorado National Forests, the City of Jackson, Caltrans, Sierra Pacific Industries, and PG&E were reviewed and summarized. These document included county general plans, fire plans, grading ordinances, land use elements, housing elements, stormwater management plans, and best management practices (BMPs). As a whole, the documents presented thoughtful and proactive approaches to protecting water quality.

The Upper Mokelumne River Watershed Authority (UMRWA) is a coalition of stakeholders (Alpine County, Alpine County Water Agency, Amador County, Amador Water Agency, Calaveras County, Calaveras County Water District, Calaveras County Public Utility District, EBMUD, Jackson Valley Irrigation District). The UMRWA is entrusted, with stakeholder and Proposition 13 and 50 grant funding, to develop the Upper Mokelumne River Watershed Assessment by 2008. The project will develop watershed assessment methodologies, compile existing data on watershed conditions, perform water quality monitoring, develop GIS and model meteorological, land-use and water management applications for water quality impacts.

The Sierra Nevada Forest Plan Amendment (2001, revised 2004) is one particularly noteworthy revision in land use management, as it imposes many new criteria on Forest Service projects for fire and fuels management, pest management, grazing, erosion control, and timber harvesting. The criteria promote reduced impacts on lands, streams, and other water bodies, and require frequent assessment of projects to allow adaptive management. Also notable is the District's implementation of Capital Security Improvement Projects following a Vulnerability Assessment performed in 2003. These projects will invest over $21M over the next five years to improve the security of the District's water supply and facilities.

Conclusions and Recommendations

The reservoir raw water qualities are very good and the WTPs are capable and reliable at treating or removing particulates, pathogens and other water quality contaminants. However, with stricter regulations and improved understanding of water quality parameters and related health effects, source protection has become an integral part of water quality management.

As part of this MRWSS Update 2005, status reports were written for potential corrective actions that were presented in previous MRWSS Update 2000. These recommendations are summarized in Table ES-1 and explained after. The recommendations take into account watershed characteristics, type and magnitude of potential contaminants, and potential risk to public health. Most of these recommendations have activities pertaining to them ongoing in the Pardee and Camanche Watersheds. A status column is included in Table ES-1 reflects whether the recommended activity has been completed, is ongoing, is under development, or has not been started.

Table ES-1: Summary of Potential Corrective Actions

#	Corrective Action	PRIORITY	2005 Status
	Water Quality Monitoring		
1	Monitoring Related to Specific Land Use and Activities	High	Ongoing
2	Reservoir Temperature Monitoring	High	Ongoing
3	TOC Monitoring	High	Ongoing
4	MTBE Monitoring	High	Ongoing
5	Pesticide and Herbicide Monitoring	High	Ongoing
6	Land Disposal Monitoring	High	Ongoing
7	Organic Contaminants Follow-up Procedure	Medium	Ongoing
8	Penn Mine Monitoring	Medium	Ongoing
9	Septic Tank Monitoring	Medium	Ongoing
10	Urban Stormwater Monitoring	Low	Not started
11	Storm-Related Turbidity Monitoring	Low	Not started
12	Bathymetric Surveys	Low	Ongoing
13	Runoff from Historic Mines	Low	Ongoing
14	Raw and Finished Water Sampling	Low	Ongoing
	Watershed Control and Management Practices		
15	Forest Practices and Logging Management	High	Ongoing
16	Grazing Practices Management	High	Complete
17	Access Control Programs	High	Ongoing
18	In-Reservoir Recreation Management	High	Ongoing
19	Recreation - Body Contact Management	High	Ongoing
20	On-site Waste Management Programs	Medium	Ongoing
21	Seismic Evaluation	Medium	Ongoing
22	Off-Road Vehicle Usage Management	Medium	Ongoing
23	Road and Landing Construction and Maintenance (Medium to High)	Medium	Ongoing
24	Fire Roads and Hiking Trails - Construction, Maintenance, and Use (Medium to High)	Medium	Ongoing

Table ES-2: Summary of Potential Corrective Actions (continued)

#	CORRECTIVE ACTION	Priority	2005 STATUS
	WATERSHED CONTROL AND MANAGEMENT PRACTICES (CONTINUED)		
25	Identifying Hazardous Materials Storage and Transfer Facilities (Medium to High)	Medium	Ongoing
26	Manage Runoff from Parking Lots and Roads (Medium to High)	Medium	Under development
27	Reservoir Shoreline Protection (Medium to High)	Medium	Ongoing
28	Protection of Riparian Corridors (Medium to High)	Medium	Ongoing
29	Equestrian Use Policy	Low	Under development
30	Concentrated Animal Facility BMPs (Low to Medium)	Low	Under development
	Inter-jurisdictional Coordination		
31	Water Quality Technical Coordination Forum	High	Ongoing
32	Emergency Response	High	Ongoing
33	Future Development	High	Ongoing
34	Stormwater Runoff	Medium	Ongoing
35	Erosion Control (Medium to High)	Medium to High	Ongoing
36	Fire Suppression - Chemical Usage	Low	Ongoing
	Public Education		
37	Residential and Commercial Neighbors (Medium to High)	Medium	Ongoing
38	Transportation Corridors	Medium	Ongoing
39	Recreational Trail Users	Medium	Ongoing
40	Community Outreach	Medium	Ongoing
41	Volunteer Organization	Low	Ongoing

(1) Monitoring Related to Specific Land Use and Activities.
The District has an on-going extensive water quality-monitoring program for Pardee and Camanche Reservoirs. The District continues to collect bacteriological data at designated sampling locations throughout the lower regions of the Upper Mokelumne River and tributaries to further develop a dataset of bacteriological conditions. Elevated coliform levels at Wilson Gulch are primarily due to lack of dilution, since it is the only sampling station not on a main fork of the Mokelumne River.

Grazing practices by the largest landholder, National Forest Service (Eldorado and Stanislaus National Forests), were modified in their 2004 Sierra Nevada Forest Plan resulting in 30 to 40 percent reduced grazing. District land grazing allotments increased by 5 percent compared to the leases in 2000 and are managed to prevent both fire and erosion.

(2) Reservoir Temperature Monitoring. The District continues to collect weekly water quality profiles at several locations in Pardee and Camanche Reservoirs. In addition, the District is calibrating a 2-D hydrodynamic model for the Pardee-Camanche system. The model will be able to simulate effects of various operations on temperature and dissolved oxygen, and will provide guidance to the reservoir Operating Committee.

(3) TOC Monitoring. The District continues to monitor TOC at Highway 49 to track the main tributary, designated locations within Pardee Reservoir and upstream tributaries, i.e., after the Power Fire in late 2004, when Salt Springs, Tiger Creek (TC), TC Canal and the TC Powerhouse were added.

(4) MTBE Monitoring. The District continues a MTBE monitoring program at both Pardee and Camanche Reservoirs, although at a lower frequency (semi-annually) due much lower MTBE levels since the District restricted gas motor types and the state banned MTBE in gasoline supplies in 2003.

(5) Pesticide and Herbicide Monitoring. The District continues to monitor pesticide and herbicide levels entering into Pardee Reservoir to detect potential water quality concerns relating to these parameters. CDHS has waived SOCs, except atrazine, di(ethylhexyl)-phthalate, glyphosate and simazine. Those compounds, known to be used on the watershed, are required for monitoring every three years at Pardee Tower.

(6) Land Disposal Monitoring. During the update period, the District's Water Supply Section performed an inventory and assessment of its wastewater collection and treatment systems. All wastewater facility locations and pertinent data for assessing their condition were input into a GIS database, which was used to prioritize repairs and to develop a proactive maintenance schedule.

(7) Organic Contaminants. Shortly after the 1995 MRWSS was published, a follow-up procedure was established for organic compounds detected in either raw or treated waters to notify CDHS and the District's sampling staff so that repeat sampling would be conducted. Two electronic backup systems are also in place to notify the District by e-mail at least daily in the event detectable levels for purposes of reporting (DLRs) are analyzed for organic compounds.

(8) Penn Mine Monitoring. The District initiated this compliance-monitoring program in 1998. Construction activity for the Penn Mine Environmental Restoration Project was completed in December 1999. Three years of post-restoration monitoring of the Penn Mine facilities were conducted to ascertain the effectiveness of this environmental restoration project in returning the site to 'pre-mining' condition. Based on the results of this monitoring, the project was deemed successful and requirements for post-restoration monitoring were eliminated by the EPA.

(9) Septic Tank Monitoring. The Calaveras County Local Agency Ground Water Protection Program was developed by Calaveras County Environmental Health in cooperation with USEPA. Initiated in 2000, the program takes a comprehensive look at ground water availability, quality, and quantity. Data is collect in a GIS, and had been used to produce a Groundwater Protection Report (2004). This report identifies and maps threats to ground water quality, including septic systems, known failed septic systems, and leaking underground storage tanks.

The town of West Point has a number of residences with septic tanks and leach fields within 200 feet of the Mokelumne River which were not included in the grant-funded expansion for their sewer collection system due to a funding shortage needed for a pump lift station. The District is investigating the potential for a joint effort with Calaveras County Water District to submit a proposal for an USEPA grant to install a pump lift station for those residences.

(10) Urban Stormwater Monitoring. Increasing development along main-stem of the Mokelumne River and Highway 89 have increased the potential impacts from urban stormwater. Construction activities in particular have the potential to contribute significant sediment loads, as was observed in January 2005 from the city of Jackson.

(11) Storm-Related Turbidity Monitoring. Following the October 2004 Power Fire, water quality samples were taken by the District, the U.S. Forest Service, and the U.S.G.S. When feasible, storm water samples were collected from tributaries in the burned area, as well as from locations upstream of the burn to provide baseline concentrations. The District's sampling program spanned October 2004 to May 2005 to capture winter storm runoff as well as snowmelt from the burned area. Results have shown limited erosion impacts contributing to increased turbidity during 2005.

(12) Bathymetric Surveys. Water Supply Engineering has scheduled a survey for Camanche and Pardee Reservoir in the next few years.

(13) Runoff from Historic Mines. The District has maintained a GIS dataset of active and inactive mines in the watershed. Calaveras County Environmental Health also tracks current and historic mining operations as well on a GIS database as part of the Local Groundwater Protection Program.

(14) Raw and Finished Water Sampling. Water quality monitoring data are collected in accordance with Title 22 monitoring requirements, the Surface Water Treatment Rule Operations Plan 2005 and is archived by the District.

(15) Forest Practices and Logging. During this update period, the Central Valley Regional Water Quality Control Board has adopted new rules to now require a discharge waiver for all Timber Harvest Plans (THPs), and all Emergency harvest operations. They are taking a more active role in proposing additional mitigation measures at the time of THP review and approval, and are usually attending pre-harvest inspections of THP areas.

(16) Grazing Practices. The District has used applied portions of its East Bay Rangeland Management Plan to a range management program in the Pardee and Camanche watersheds. Stocking levels are set based on rainfall and subsequent forage production each year, and lease agreements contain a residual dry matter (RDM) requirement to provide ground cover and minimize erosion. The Sierra Nevada Forest Plan Amendment (2004) recommended management of National Forests lands to attain 30 to 40 percent reduction of grazing allotments.

(17) Access Control Programs. Following a Vulnerability Assessment conducted in 2003, the District has been implementing Capital Security Improvement Projects that will invest $20M over the next 10 years. The projects include improvements in fencing , gate access controls, and alarm systems throughout the water systems. In addition, Security Shift Supervisors have been added to patrol sites including source waters.

The Sierra Nevada Forest Plan Amendment (2004) contains new guidelines for restricting human and animal access to certain aquatic, riparian, and meadow ecosystems. Stanislaus National Forest produced a Forest Plan Direction for Motor Vehicle Management (2004) that establishes areas in Federal lands that are closed to off-highway vehicle (OHV) access. Sierra Pacific continues its efforts to prevent illegal OHV access to its logging road network.

The Stewardship council is funded by PG&E with $70 million over 10 years to protect its watershed lands throughout California as part of its 2003 bankruptcy agreement. Of that balance, $20 million is expected to go into the planning process and with the remainder going into physical improvements, such as planting of trees to enhance fish and wildlife habitat and water quality. Presently, the amount of affected lands within the Upper Mokelumne Watershed (about 3 percent of PG&E's total) has not been determined.

(18) In-Reservoir Recreation. Boating policies continue to be enforced at the District's recreation facilities to prevent the introduction of exotic species to Pardee and Camanche Reservoirs. Though all boats cannot be inspected for invasive aquatic organisms, monthly Zebra mussel sampling in 2005 by the Department of Water Resources resulted in no detections in Pardee. (p. 5-14).

(19) Recreation – Body Contact. The District continues its policy to prohibit body-contact recreation at Pardee Recreation Area and limit body-contact recreation at Camanche South Shore Recreation Areas away from the water intake. In 2003, the District officially sanctioned the use of a portion of the property in the Middle Bar Bridge area, above Pardee Reservoir, for the use of river rafters and kayakers to exit the river.

(20) On-site Waste Management Programs (OWTS). Signed into law in 2000, AB885 authorized regulation of OWTS through the SWRCB, which is releasing a draft EIR in early 2006 for implementation in 2007. Proposed regulations will require: an operation permit for new systems dispersing under-pressure, at-grade or above-ground, permits for new or replacement OWTSs, effluent concentration and dispersal solids size limitations, designer, operator and evaluator professional certification, inspection of septic tank by qualified provider upon property ownership change, groundwater monitoring in vicinity of the OWTS discharge and installation of supplemental treatment systems to meet effluent limitations. Though intended for state-wide application, implementation will be contingent upon the resources available for each county. The upgrade requirement for installation of supplemental treatment systems to meet effluent limitations will most likely apply to OWTS within 600 feet of an impaired waterbody on the 303(d) list.

(21) Seismic Evaluation. Pardee Tower has been evaluated on a preliminary basis in 1987 and 1998, with a final analysis forthcoming.

(22) Off-Road Vehicle Usage. Off-Highway Vehicles (OHVs) have been recognized by the Chief of the Forest Service as one of the key threats facing the nation's forests. In June 2004, Stanislaus National Forest produced a Forest Plan for Motor Vehicle Management that increases restrictions or bans OHV access. The Eldorado National Forest implemented a ban on all OHV use off designated trails in August 2005, closing approximately 700 miles of non-system routes while an EIS is in progress.

(23) Road and Landing Construction and Maintenance. In 2001, the Forest Service issued the final National Forest System Road Management Rule which is designed to shift the emphasis from construction of new roads to managing existing roads and decommissioning unneeded roads in the interest of ecosystem health. The Stanislaus Forest Roads Analysis (2004) meets the requirement for a roads analysis, and contains site-specific guidelines for assessing and managing existing Forest Service roads to minimize erosion. Sierra Pacific is increasing the amount of road crossing repairs and replacements, and the amount of road rocking and other techniques (such as the placement of filtering straw bales, straw wattles, and mulching techniques) when working in proximity to streams.

(24) Fire Roads and Hiking Trails. Recreation influenced by the 2004 Power fire included: nine campsites, many hiking trails, and over 200 miles of OHV routes. The fire and the restoration projects have opened new clearings, skid trails, and haul roads, which historically have been subject to illegal OHV activity.

(25) Hazardous Materials Storage and Transfer Facilities. The District performs annual updates its Environmental Emergency Response and Release Prevention Plans for all facilities where hazardous materials are handled or stored. .

(26) Runoff from Parking Lots and Roads. In June 2001, Pardee Center obtained a NPDES Industrial Storm Water Permit from the California Regional Water Quality Control Board for operations associated with the Pardee lime facility. The District developed and implemented a Storm Water Pollution Prevention Plan and a Monitoring and Reporting Program in compliance with the permit conditions. The District is requesting removal from the storm water program in 2006.

(27) Reservoir Shoreline. Boating policies are enforced at the recreation areas of Pardee and Camanche Reservoirs to restrict speeds for public safety and environmental protection.

(28) Protection of Riparian Corridors. EBMUD guidelines for all District-owned lands focus on implementing and maintaining best management practices to protect natural resources that include the riparian zones under District jurisdiction. – Under development as part of the Mokelumne Watershed Master Plan. It will begin in 2006 with completion of data-gathering scheduled in 2007.

(29) Equestrian Use. (Low Priority) – Under development as part of the Mokelumne Watershed Master Plan. It will begin in 2006 with completion of data-gathering scheduled in 2007.

(30) Concentrated Animal Facilities. (Low to Medium Priority) – During the update period, no facilities were found.

(31) Water Quality Technical Coordination Forum - now the Upper Mokelumne River Watershed Authority (UMRWA). The UMRWA is a coalition of stakeholders (Alpine County, Alpine County Water Agency, Amador County, Amador Water Agency, Calaveras County, Calaveras County Water District, Calaveras County Public Utility District, EBMUD, Jackson Valley Irrigation District). The UMRWA is entrusted, with stakeholder and Proposition 13 and 50 grant funding, to develop the Upper Mokelumne River Watershed Assessment. The project will develop watershed assessment methodologies, compile existing data on watershed conditions, perform water quality monitoring, develop GIS and model meteorological, land-use and water management applications. Scheduled for completion in FY08, impacts on water quantity, power revenue and water quality will be evaluated with varied land-use alternatives within the watershed.

(32) Emergency Response. EBMUD's Mokelumne Watershed and Recreation Division has Resource Patrol Units (RPU) whose primary responsibility is to protect the public and District property in the Mokelumne area. Assisting rangers in patrol functions are local sheriffs brought in under contract. Two full-time deputies from both Amador and Calaveras counties are assigned year-round to District lands. The RPU also takes the lead for the District response to wildland fires on or near our property, in addition to other emergencies. If there is a report or threat of a terrorist or other security concern or any natural or man-caused emergency, while Mokelumne staff coordinates these matters with the local Sheriffs offices, fire departments and other resources, the District Security and Emergency Preparedness Office at the Security Operations Control Center (SOCC) will also be called, at 510-287-0999. The SOCC will notify the on duty Shift Supervisor and the Manager of Security and Emergency Preparedness, who will coordinate with the involved superintendents and managers in the Mokelumne area, and scale the appropriate response and Emergency Operations Center support in keeping with the Standardized Emergency Operations System, National Incident Management System and the National Response Plan.

(33) Future Development. The UMRWA is evaluating watershed impacts from its Upper Mokelumne River Watershed Assessment, scheduled for completion in FY08. The consultant is developing a model for determining threats to beneficial uses. Public drinking water supplies will be evaluated along with recreation, riparian and aquatic habitats. Potential threats of significance include: timber harvesting, hydropower production, wildfires and land development.

NPDES C.3 requirements started taking effect in 2004, with planning implications for each new development or significant redevelopment. But the timing of feedback from review for each permit is crucial since conditions of approval can only be changed in the planning phase, with the CEQA documentation, if required. Only during the planning department or planning commission approval stage can the project have attached Conditions of Approval with Best Management Practices (BMPs) techniques effectively implemented. After that initial approval phase, more Conditions of Approval are not possible.

(34) Stormwater Runoff. Power fire effects are still preliminary since less than one year of monitoring was available since the October 2005 report was available. While the water quality impact of runoff after the fire appeared insignificant, the runoff for the period after the fire was relatively light.

Paved and unpaved roads are in the process of being inventoried for potential spill impacts into the Mokelumne River. Collaboration will then take place with Alpine, Amador and Calaveras counties to review response plans to spills at sites with the most risk to the District.

(35) Erosion Control. The 2004 Power Fire impacts are a concern with severely steep portions of the burned watershed still at risk of accelerated erosion. The potential exists, especially with warm tropical storms on a light snow-pack, for highly turbid and silted runoff to occur in the near future. With the Upper Mokelumne River Watershed Assessment modeling and data compilation efforts, more information will result on impacts of housing development, timber harvesting and wildfires.

(36) Fire Suppression Chemical Usage. Power Fire chemicals used in October 2004 were standard fire retardants from aerial applications. Their impacts were not evaluated specifically.

(37) Residential and Commercial Neighbors. Highest priorities include: septic tank leach field systems along the Mokelumne River, erosion from grading of private roads and animal containment to avoid bank erosion and microbial contamination of streams. Communications during the UMRWA meetings provide a forum for discussing these causes and their impact on water quality. Associations with stakeholders can foster assistance in disseminating BMPs to lessen the impacts from residential and commercial activities.

(38) Transportation Corridors. Highest priority would include: an inventory paved and unpaved roads with high potential spill impacts into the Mokelumne River. As in Tasks 32 Emergency Response and 34 Stormwater Control above, collaboration with Alpine, Amador and Calaveras counties to review response plans to spills at sites with the most risk to the District will be addressed in the near future.

(39) Recreational Trail Users. Source water protection and water quality awareness pamphlets have been developed by the District and are available at the District's recreation facilities to the public.

(40) Community Outreach. Highest priority would include: septic tank leach field systems along the Mokelumne River, erosion from grading of private roads, kayaking, river-rafting impacts and animal containment to avoid bank erosion and microbial contamination of streams. Communications during the UMRWA meetings provide a forum for discussing these causes and their impact on water quality. Community workshops in Jackson and Mokelumne Hill in 2004 and 2005 were professionally-led on the UMRWA project goals, tasks and schedule to ensure sufficient representation of watershed interests for viable watershed assessment and management plan.

(41) Volunteer Organizations. Highest priorities include: trail maintenance projects to avoid bank erosion and kayaking/river-rafting activities to prevent microbial contamination of streams. Communications during the UMRWA public outreach and stakeholder meetings provide a forum for discussing development, wildfires and timber harvesting impacts on water quality.

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Sanitary Survey Requirements

The Surface Water Treatment Rule (SWTR) approved by Congress in 1989 includes a recommendation for all surface water systems to conduct watershed control plans. As the primacy agency for the implementation of the SWTR, the California Department of Health Services (CDHS) specified that all surface water utilities shall prepare a watershed sanitary survey of their water supply watersheds by January 1, 1996 and update it every five years thereafter.

Title 22 of the California Code of Regulations requires that the watershed sanitary survey includes a physical and hydrological description of the watershed, an evaluation of raw and finished water quality data, a description of activities and sources of potential contamination, a description of watershed control and management practices, an evaluation of the system's ability to meet requirements of Title 22 - Chapter 17: Surface Water Filtration and Disinfection Treatment, and recommendations for corrective actions.

In December 1995, the East Bay Municipal Utility District (District) submitted the first Mokelumne River Watershed Sanitary Survey (1995 MRWSS) to CDHS in compliance with all regulations and requirements. The 1995 MRWSS focused on lands that drain into Pardee Reservoir. In December 2000, the District submitted the first five-year update of the Mokelumne River Watershed Sanitary Survey (MRWSS Update 2000) to CDHS. The MRWSS Update 2000, expanded the scope of the original 1995 MRWSS by adding an assessment of the Camanche Watershed, defined as lands that lay between Pardee Dam and Camanche Dam that drain into Camanche Reservoir. The document -- the 2005 Mokelumne River Sanitary Survey Update (MRWSS Update 2005)-- is the second five-year update of the 1995 MRWSS. It carries forward the expanded scope of the 2000 MRWSS Update, and meets all requirements for preparation as described in Title 22.

The major emphasis in the MRWSS Update 2005 continues to be the identification of potential contaminant sources and their corresponding water quality concerns. While all regulated water quality parameters are addressed, microbiological parameters serve as the primary focus. Of particular interest are the potential sources of *Giardia* and *Cryptosporidium*, in part due to the treatment challenges associated with these pathogens.

Objectives

The main objectives of this MRWSS Update 2005 parallel those from the first update in 2000:

1. Satisfy all SWTR requirements for a watershed sanitary survey
2. Document changes that have taken place in the Pardee and Camanche watersheds during the 2000-2004 update period.
3. Produce a report that updates the 1995 MRWSS and MRWSS Update 2000 while retaining pertinent information from these previous documents.
4. Evaluate the water quality concerns pertaining to District's Pardee and Camanche Reservoirs.
5. Develop a document that complements the District's Year 2005 Update of the East Bay Watershed Sanitary Survey (EBWSS Update 2005)

Additional objectives were established for the MRWSS Update 2005. With ten years of data collected since the original 1995 MRWSS, one additional objective was to identify trends in water quality and contaminant sources. With the proliferation of Geographic Information Systems (GIS) in public and private agencies within the watersheds, an effort was made to collect as much GIS data as possible from outside agencies, with the objective of expanding the District's GIS for evaluating contaminant sources. Lastly, a few specific events that had potential to affect water quality were described in greater detail than in previous updates. This was done to more thoroughly document specific water quality impacts and agency (District and others) responses to these events, which can be studied to form the basis for future recommendations.

Survey Methods

The MRWSS Update 2005 was conducted by District staff in the Operations Division. The 1995 MRWSS and MRWSS Update 2000 were reviewed and all text, tables, and figures that required potential updating were identified. A series of tables was developed that highlighted each of these items and identified potential sources for updated information. The project team was formed and District staff were identified to provide key elements of the report. Information was then gathered and compiled. As part of this effort, documents were reviewed, water quality data were analyzed, hydrologic data were updated, and a field survey of the District's Pardee and Camanche small water systems was conducted.

Report Organization

The document is organized into seven sections

Section 1: Introduction gives an overview of watershed sanitary survey requirements, objectives, and methods.

Section 2: Water Supply, Conveyance, and Treatment Systems is an overview of the District's facilities and operations. As the District is a minor landowner within the Camanche and Upper Mokelumne River Watersheds, agencies with water supply facilities or whose activities directly impact water quality and quantity are also highlighted in Section 2.

Section 3: Watershed Description contains a description of watershed characteristics (location, geology and soils, vegetation and wildlife, drainage basins, precipitation and evaporation, local runoff and diversions). Section 3 also documents the land uses, land ownership and jurisdictional authority within watershed lands.

Section 4: Water Quality includes a discussion of drinking water regulations, water quality monitoring that is conducted by the District, analysis of raw and finished water data, and evaluation of the District's water treatment facilities to meet the requirements of the SWTR and Interim Enhanced Surface Water Treatment Rule (IESWTR).

Section 5: Potential Contaminant Sources in the Watersheds documents the locations of potential contaminant sources in the watersheds and identifies the key water quality parameters of concern associated with each contaminant source. In addition, the relationships between the water quality parameters of concern and the significance of the potential corresponding contaminant sources identified are discussed.

Section 6: Watershed Control and Management provides an overview of the District's management practices pertaining to the watersheds and to the protection of source water. Also, the management practices of other agencies with jurisdiction over the watershed lands are discussed in this section.

Section 7: Potential Corrective Actions recommends corrective actions based on the evaluation of water quality, potential contaminant sources, and management practices.

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Overview

The District supplies water to nearly 1.3 million people within 20 incorporated cities and 15 communities in Alameda and Contra Costa Counties. The water system provides water to a 325 square-mile area from Crockett to San Lorenzo, the San Ramon Valley, and from Walnut Creek to the San Francisco Bay. In addition, the District operates four small water systems adjacent to Pardee and Camanche Reservoirs.

On average, about 90 percent of the District's water supply originates from Pardee Reservoir on the Mokelumne River. From Pardee Reservoir, Mokelumne River water is diverted and transported to EBMUD's service area in the San Francisco Bay Area. Pardee Reservoir is also the water source for the District's Pardee Center and Pardee Recreation Area facilities.

Camanche Reservoir, located just downstream of Pardee Reservoir, serves as the source of supply for the District's Camanche South Shore Recreation Area. The District's Camanche North Shore Recreation Area is located along the northern shoreline of Camanche Reservoir, but is supplied by groundwater. Figure 2-1 provides an overview of the Pardee and Camanche Reservoir facilities. Figure 2-2 depicts the flow and distribution of water for the District's water supply facilities.

All raw water, whether taken directly from the District's reservoirs or aqueducts, is treated at one of the District's water treatment plants (WTPs). The District operates four small water systems that are proximate to the Pardee and Camanche Reservoirs – Pardee Recreation Area WTP, Pardee Center WTP, Camanche South Shore WTP and Camanche North Shore WTP. Camanche North Shore WTP is the only small water system that is supplied by groundwater. In addition to the small water systems, the District operates six large system WTPs in the East Bay; three of which, the Orinda, Lafayette and Walnut Creek WTPs treat Mokelumne River water directly (although the Orinda WTP can also treat stored Mokelumne water from Briones Reservoir). Only the four small water systems and the Walnut Creek, Lafayette, and Orinda WTPs are discussed in this document. The District's other East Bay WTPs and facilities are discussed at length in the East Bay Watershed Sanitary Survey and its updates.

Raw Water System, Storage, and Operation

The focus of this document is the Upper Mokelumne River watershed lands in association with the District's water supply facilities at Pardee and Camanche Reservoirs. The District has water rights (up to 325 MGD) to the 577 square-mile Upper Mokelumne River watershed on the west slopes of the Sierra Nevada Mountains. Representing the District's major source of supply, the Mokelumne River has supplied the District with an average annual draft of 193 MGD from 2000 through 2004.

Upper Mokelumne Watershed Area Facilities

The Upper Mokelumne Watershed is defined as the watershed lands that contribute flow to the North Fork, Middle Fork, South Fork, and Mainstem of the Mokelumne River which then drain to Pardee Reservoir (as shown in Figure 2-1). For the purposes of this document, the sub-basin immediately surrounding Pardee Reservoir and extending upstream to include the Mainstem of the Mokelumne River is referred to as Pardee Watershed. Pardee Watershed Facilities are shown on Figure 2-3. For descriptions of the reservoir and tower, please see pages 2-6 to 2-8 of the 2000 Mokelumne Watershed Sanitary Survey (2000 MRWSS).

Mokelumne River water is diverted from Pardee Reservoir at the District's Pardee Outlet Tower. The water is conveyed through the Pardee Tunnel to the Campo Seco facility where it trifurcates to the three Mokelumne Aqueducts. The water then flows by gravity 91.5 miles to the District's service area in the San Francisco Bay Area. In Walnut Creek, the Mokelumne Aqueducts connect with the east terminus of the two Lafayette Aqueducts where it is conveyed directly to several WTPs or stored in the District's Briones, San Pablo, and Upper San Leandro Reservoirs (Figure 2-2).

EBMUD has water rights and facilities to divert up to 325 MGD from the Mokelumne River, subject to the availability of Mokelumne River runoff and the prior water rights of other users. Figure 2-4 provides an overview of the Mokelumne River diversions and flows including the District's water rights. The District's position in the hierarchy of Mokelumne water users is determined by a variety of agreements between Mokelumne water right holders, the appropriative water rights permits and licenses which have been issued by the state, pre-1914 rights, and riparian rights (see Figure 2-5). Conditions that restrict the District's ability to use its 325 MGD entitlement include upstream water use by prior right holders, downstream water use by riparian and senior appropriators and other downstream obligations, drought, or less than normal rainfall for more than 1 year, and emergency outage.

In addition to the District's Pardee Reservoir facilities, there are five upstream agencies -- Amador Water Agency, Jackson Valley Irrigation District, Calaveras Public Utility District, Calaveras County Water District, and PG&E -- that have diversion structures and/or powerhouses along the Mokelumne River that can impact the availability of the District's Mokelumne River supplies. With the exception of PG&E, Table 2-1 summarizes the future water demands for these agencies. Updates to these agencies' facilities or operations are described below.

North Fork of the Mokelumne River

PG&E and Amador Water Agency operate facilities on the North Fork of the Mokelumne River. The storage reservoir capacities and associated engineering data for the facilities that are managed by these two agencies are listed in Table 2-2.

PG&E

The PG&E Mokelumne Hydroelectric Project (Project 137) is operated in accordance with judgments and decrees associated with the City of Lodi and the District. These decrees, commonly known as the "Lodi Decree" define the relative rights of Lodi, PG&E, the District, and areas around Jackson and Sutter Creek. The Lodi Decree addresses the timing and quantity of PG&E discharges of water into the Mokelumne River. The releases from PG&E's Mokelumne hydroelectric system can have impacts upon the District's exercise of its Pardee and Camanche water rights in particular, during the late summer and fall months. Detailed descriptions of these facilities are in Section 2 of the 2000 Mokelumne Watershed Sanitary Survey.

In October 11, 2001 the Federal Energy Regulatory Commission (FERC) issued an order approving a new operating license for PG&E's Project 137. As part of the new license, several dams on creeks have been breached or completely removed. Two minor generation capacity upgrades totaling 4.7 MW were approved, though not implemented. The new license included provisions to comply with the Federal Power Act Section(4e) requirements. Among the modifications to the operations were new minimum streamflows, pulse flow requirements, short-term power generation constraints, new ramping rates, and summer releases for river recreation. Many of the instream flows and resource management measures had been in place since PG&E's 1996 Fish and Wildlife Agreement with California Department of Fish and Game (CDFG). Lodi

Decree rules still govern PG&E of releases downstream of Project 137 into the Mokelumne River, but the new license requirements may seasonally change the timing of flows.

Amador Water Agency (AWA)

The Central Amador Water Project (CAWP) is owned and operated by the Amador Water Agency. The agency has entitlements from the Mokelumne River that presently allows it to divert 1,600 acre-feet of water from the Mokelumne River. The water source for the CAWP is rainfall and snowmelt stored in the Tiger Creek Afterbay. Water is pumped up 1,230 feet from the Tiger Creek Afterbay to the Highway 88 ridge, then treated at the Buckhorn WTP to supply many small communities including Pine Grove, Jackson Pines, and Pioneer. A new Buckhorn WTP was completed in May 2005. This microfiltration facility has current average production rate of 0.9 MGD, and a maximum capacity of 2 MGD. Amador Water Agency also has facilities on the Mainstem of the Mokelumne River, which are discussed below.

Middle and South Forks of the Mokelumne River

Two agencies that divert water along the Middle and South Forks of the Mokelumne River include Calaveras Public Utility District and Calaveras County Water Agency. Table 2-1 documents the future water demands of these agencies and Table 2-2 summarizes the storage reservoir capacities and associated engineering data for these two agency facilities.

Calaveras Public Utility District.

The Calaveras Public Utility District (CPUD) currently services approximately 1,825 households in the communities of San Andreas and Mokelumne Hill (the 2000 MRWSS estimate was 1,800 households). CPUD diverts water at the confluence of the Licking Fork and South Fork of the Mokelumne River by pumping to Jeff-Davis Reservoir near Glencoe using one or two 400 hp pumps, each rated at about 2000 gpm. The diversions occur throughout the year except during high turbidity periods caused by winter storms. Jeff-Davis Reservoir, which has a storage capacity of 2,000 acre-feet, also receives water supplies from other sources in the Calaveras River watershed.

The 1940 and 1970 agreements between CPUD and the District entitle CPUD to divert up to 2,130 acre-feet annually to storage, and up to 15 cfs for direct offstream use. Current water deliveries vary from 19 MG per month in the winter to 60 MG per month in the summer. CPUD estimates population in the service area may increase 2% per year. The projected water demand from the Mokelumne River by CPUD in the year 2020 is 4,910 acre-feet. The Mokelumne Hill Ditch (owned and operated by CPUD) on the South Fork of the Mokelumne River has been out of service since 1974 and is not anticipated to be used in the future due to excessive leakage. Additional information on CPUD's facilities can be found in CCWD/CPUD's Upper Mokelumne River Sanitary Survey (Tetra Tech, 2000).

Calaveras County Water District

Calaveras County Water District (CCWD) diverts water primarily through a gravity diversion on Bear Creek, approximately 6 miles above the confluence with the Middle Fork. A secondary pumped diversion point on the Middle Fork of the Mokelumne River is sometimes used during the summer. CCWD's entitlement is for up to 400 acre-feet per year, at a rate not to exceed 6 cfs, in conformance with the 1958 and 1964 agreements between CCWD and the District. Water is treated at the West Point Water Treatment Plant, which was upgraded 2002 with capacity to serve about 900 single family homes. The treatment plant serves CCWD's West Point and Wilseyville service area, with 549 current water service connections. Projected growth is 2 to 5 connections per year. Additional information on CCWD's facilities can be found in their Upper Mokelumne River Sanitary Survey (Tetra Tech, 2000).

Mainstem of the Mokelumne River

The three agencies that divert water along the Mainstem of the Mokelumne River include Jackson Valley Irrigation District, Amador Water Agency, and PG&E. Table 2-1 documents the future water demands of these agencies and Table 2-2 summarizes the storage reservoir capacities and associated engineering data for these two agencies facilities.

Jackson Valley Irrigation District

The Jackson Valley Irrigation District (JVID) provides irrigation water to farmlands in the lower elevations of Amador County. Water for use by JVID is diverted at the Jackson Creek spillway structure on the north arm of Pardee Reservoir into Carson Creek for export to Lake Amador. JVID has an entitlement to divert up to 3,850 acre-feet annually from Pardee Reservoir under an assignment of the 1927 State Department of Finance filing, and also maintains water rights to divert up to 6,000 acre-feet per year from Jackson Creek.

Amador Water Agency

The Amador Canal is owned and operated by the Amador Water Agency. Water is diverted from Lake Tabeaud through the canal to the Tanner and Ione Water Treatment Plants to supply the customers in Jackson, Ione, Amador City, Sutter Creek, and Drytown. Although the Amador Canal was purchased by AWA from PG&E in 1985, PG&E retained ownership of the water rights. AWA's contract with PG&E allows 15,000 acre-feet to be diverted into the canal during normal and wet years. The diversion is subject to a 25 percent reduction in dry years but delivers only about half of this supply because of conveyance losses. Replacement of the canal with a pipeline has planned to reduce losses and risk of contamination. Construction was scheduled for 2005. AWA's entitlements are subject to 1977 and 1978 agreements among AWA, EBMUD, Amador County, and Pioneer Community Services District.

PG&E

PG&E owns and operates Lake Tabeaud which serves as the forebay for the Electra Powerhouse, which is located about five miles upstream of Pardee Reservoir. Detailed descriptions of Electra Powerhouse and other facilities can be found in Section 2 of the Mokelumne Watershed Sanitary Survey (1995, updated 2000).

Camanche Watershed Area Facilities

Figure 2-6 depicts the Camanche Watershed, Camanche Reservoir and its corresponding facilities. General descriptions of these facilities are in Section 2 of the Mokelumne 2000 Watershed Sanitary Survey.

Reservoir Operations

Pardee and Camanche Reservoirs operations are constrained by water rights, water quality, flood control, storage, water supply, and power generation criteria, as described in the 2000 MRWSS. There are no updates to these operating criteria since the previous Watershed Sanitary Survey.

Pardee Reservoir Operations 2000-2004

Figure 2-7 shows summary of Pardee Reservoir operations for the 2005 update period compared to typical operations. Hydrologically, the five years were average or below average. More on hydrology can be found in Section 3 of this report. Despite the lower inflows, Pardee Reservoir filled to within 1 foot of the spillway by the beginning of the summer of each year, maximizing water available to the District's service area and the water available for the fall cold water release to Camanche Reservoir. Inflows from spring runoff were well below median for 2001, 2002, and 2004 as shown in the second graph of Figure 2-7. During the update period, Pardee Reservoir only spilled during June 2003. This is very different from the previous five years (1995-1999), when there were 18 months during which Pardee Reservoir spilled.

Below average inflows resulted in below average releases to Camanche Reservoir each spring, as shown on the graph at the bottom of Figure 2-7 . This plot also shows the increases in October releases every year as cold water from Pardee is released to maintain stratification in Camanche Reservoir. The Power Fire in October 2004 threatened to increase turbidities due to erosion of the denuded areas. Impacts of the Power Fire are discussed in Section 5.

Camanche Reservoir Operations 2000-2004

Camanche Reservoir operations for the update period are shown in Figure 2-8. The reservoir did not overtop its spillway during this period, and has only done so twice in the past 25 years (Feb '86 and Jan '97). The lowest end-of-month elevation during this period was Sept 2001, when the reservoir was at 200.40 ft or 47% percent of capacity. The second plot on Figure 2-8 shows that inflows were below median for most months during the update period, which resulted in relatively few releases for flood control. Releases met Joint Settlement Agreement (JSA) required flows for all months during the update time frame. Total release from Camanche averaged 418 cfs for the update period, with a maximum day release of 2,406 cfs.

Outlet Tower Locations and Protection Features

The locations of the District's outlet towers are shown in Figure 2-3 (Pardee Reservoir) and Figure 2-6 (Camanche Reservoir). All of the District's outlet towers are protected by exclusion zones with warning signs posted on the reservoir and shorelines.

The Pardee Outlet Tower has gates (at elevations 550 feet, 520 feet, 490 feet, and 460 feet) which are operated to obtain the best quality water available at the outlet tower for diversion to the District's service area. Reservoir turbidity and algae data determine which outlet gates are used at any given time.

Chemical Additions to Raw Water

The Pardee Chemical Building located at Pardee Center is operated to maintain pH and disinfection levels in the water being conveyed through the Mokelumne Aqueducts. Liquid lime is added at Pardee Center to maintain a target pH of 8.7 to 8.9. This chemical addition is required to protect the aqueduct lining from corrosion and to add alkalinity to facilitate coagulation in water treatment plants that treat water directly from the Mokelumne Aqueducts.

The District adds chlorine solution in the form of sodium hypochlorite to the Mokelumne Aqueducts to control biological growth and meet the disinfection (Ct) requirement of the SWTR. Sodium hypochlorite is added at Pardee Center and, if needed again, at Bixler Chemical Facility in the Sacramento-San Joaquin Delta.

Water Treatment Plant Facilities and Operations

EBMUD operates a total of seven water treatment plants (WTPs) -- three large systems and four small systems -- that treat water from either the Pardee or Camanche Reservoirs. The three large systems (serving over 10,000 people each) are the Walnut Creek, Orinda, and Lafayette WTPs located in the District's East Bay service area. These water treatment plants treat Mokelumne River water transported from Pardee Reservoir through the Mokelumne Aqueducts (refer to Figure 2-2 for a schematic diagram showing the flows and distribution to these water treatment plants). The four small systems (serving less than 10,000 people each) are the Pardee Recreation Area, Pardee Center, Camanche South Shore, and Camanche North Shore WTPs. Pardee Recreation Area and Pardee Center WTPs treat Pardee Reservoir water. Camanche South Shore WTP treats Camanche Reservoir water. Camanche North Shore WTP treats groundwater from three wells.

Pardee Recreation Area Water Treatment Plant

The Pardee Recreation Area WTP serves a transient, non-community small water system which is located on the north shore of Pardee Reservoir. The water treatment plant intake is located south of the Recreation Area marina (Figure 2-3). The maximum capacity of the plant is 100 gpm. Raw water is pumped through a 6-inch pipeline from the reservoir by two, 100 gpm pumps mounted on a floating platform. The intake depth is suspended approximately 40 feet below the water surface. An exclusion zone restricts recreation in proximity to the intake both from the shore and from the reservoir. The Pardee Recreation Area WTP employs ultrafiltration and uses sodium hypochlorite for disinfection. The sodium hypochlorite is stored in 50-gallon containers with spill containment around each.

Pardee Center Water Treatment Plant

The Pardee Center WTP is a non-transient, non-community small water system which is located on the west shore of Pardee Reservoir. The water treatment plant intake is located adjacent to the Pardee Outlet Tower along the southwestern arm of Pardee Reservoir (Figure 5-2). The maximum capacity of the plant is 10 gpm. Raw water is pumped from the reservoir by two, 100 gpm pumps through a 6-inch pipeline. An exclusion zone restricts recreation in proximity to the intake both from the shore and from the reservoir. The Pardee Center WTP employs nanofiltration membranes and uses sodium hypochlorite for disinfection. The sodium hypochlorite is stored in 50-gallon containers with spill containment around each. Soda ash is used also for corrosion control.

Camanche South Shore Water Treatment Plant

The Camanche South Shore WTP supplies the Camanche South Shore Recreation Area and adjacent residences. The maximum capacity of the plant is 480 gpm. The intake supplying the water treatment plant is located about 1,200 feet from the shore along the north side of the recreation area (Figure 5-16). A minimum 500-foot protection zone is established around the intake location. Raw water is continuously withdrawn from Camanche Reservoir by two, 250 gpm pumps mounted on a floating platform which draw water from a depth of 32 feet below the surface of the water. Treatment consists of the addition of coagulant and coagulant-aid; in-line filtration through two banks of four filters each; and pre-filtration and post-filtration chlorination. Filtration consists of eight dual media, anthracite/sand, filters each with each 20 square feet of filter surface rated at 3 gpm/sf.

Camanche North Shore Water Treatment Plant

The Camanche North Shore WTP is a small water system that supplies the Camanche North Shore Recreation Area with potable water (Figure 5-17). The source of supply for the Camanche North Shore Recreation Area is groundwater drawn from three wells. Table 2-3 contains information on the Camanche North Shore WTP well system. The raw water is treated by two manganese greensand filters and chlorination to reduce the iron and manganese in the source water. Calcium hypochlorite is stored in dry 40-pound pails and potassium permanganate used during treatment is stored in 200-gallon tank containers. Spill containment facilities are provided. The greensand filters will be replaced with pyrolucite filters; this will eliminate the need for potassium permanganate addition.

Walnut Creek Water Treatment Plant

Walnut Creek WTP generally treats Mokelumne Aqueduct water from Pardee Reservoir. Due to the high quality of the Mokelumne Aqueduct water, the Walnut Creek WTP was designed and permitted to operate as an in-line water treatment plant. In emergency situations water from Briones Reservoir can also be treated at the Walnut Creek WTP. Pre-treatment consists of addition of coagulant and coagulant-aid (polyaluminum chloride and cationic polymer) and sodium hypochlorite. The plant has six gravity filters with anthracite/sand media. Each filter can operate at 20 MGD rate, for maximum instantaneous plant production rate of 120 MGD, or a rate of 100 mgd with one filter in standby. Sodium hypochlorite, fluoride and caustic soda can be added at several locations in the plant, the most common is in the combined filter effluent pipe before the treated water is delivered into a clearwell. Ammonia is added to the clearwell effluent. The level of the clearwell is controlled by the District's Operation Control Center (OCC) in Oakland.

Backwash water is discharged currently into a temporary tank. By the end of 2005, the backwash water will be discharged into two backwash water equalization basins. Anionic polymer is added to the waste washwater to improve solids settling. Supernatant from the waste washwater system is chlorinated and pumped back into the Mokelume Aqueducts that flow to Orinda. Sludge from the washwater basin is drained to a 0.5 MG sludge detention basin prior to removal by trucks to the District's wastewater plant (SD1)

The following improvements are being constructed and will be completed by the end of 2005 at the Walnut Creek WTP

- Increase reliable treatment capacity -- with one filter off-line
- Upgrade chemical systems to improve reliability and increase storage and feed capacity
- Upgrade the waste stream treatment system to increase reliable treatment capacity and improve treatment performance
- Upgrade instrumentation and control systems
- Improve seismic safety of buildings

When the new waste stream treatment system is completed, the highly treated backwash waste stream will be pumped to the plant headwork to combine with the raw water for reuse as water supply instead of returning it to the Mokelume Aqueducts.

Lafayette Water Treatment Plant

Lafayette WTP has the smallest service area of the District's Mokelumne water treatment plants in the District's East Bay Service Area. Under normal conditions Lafayette WTP treats Mokelumne Aqueduct water from Pardee Reservoir during high demand periods. An average flow of 20 MGD is treated at the Lafayette WTP during the high demand periods. During the low demand periods in winter, the plant is taken out of service for two to four months.

Due to the high quality of the Mokelumne Aqueduct water, the Lafayette WTP was designed and permitted to operate as an in-line water treatment plant. The Lafayette WTP process train consists of chemical pre-treatment, in-line filtration, and chemical post-treatment. Pre-treatment consists of coagulant (polyaluminum chloride and cationic polymer) and sodium hypochlorite addition at the rapid mix. After chemical addition, the water flows to the filters. The plant has a total of 8 declining rate filters, though only 6 are in service due to underdrain and filter box deficiencies. A project to reconstruct the filters is in planning phase. Normally, the plant operates with anywhere from 3 to 5 filters in service with at least 1 filter in reserve. After filtration, sodium hypochlorite, fluoride, caustic soda and ammonia are added to the water as it flows by gravity through a 48-inch pipe into an above ground, cylindrical clearwell. Flow capacity through the plant is automatically regulated by combination of water elevation at the control works and the water elevation in the clearwell. The level of the clearwell is adjusted by the District's Operation Control Center (OCC) in Oakland.

Backwash water from the Lafayette WTP is discharged to the washwater solids handling facility which includes an equalization basin, solids thickener basin (clarifier), and solids storage basin. Anionic polymer (solids conditioner) is added to the spent backwash water as it is pumped from the equalization basin to the solids thickener. Reclaimed water is pumped back to the Mokelumne aqueducts that supply the Orinda WTP.

Orinda Water Treatment Plant

The Orinda WTP has the largest production capacity of the District's water treatment plants. Over the last 10 years the plant has provided 58 percent of the water to the District's Bay Area distribution system and has an instantaneous capacity of 200 MGD. A new chemical building, new chemical systems filter improvements (including new underdrains and added anthracite media) and miscellaneous plant improvements were added between 1995 and 1997.

Under normal conditions Orinda WTP treats Mokelumne Aqueduct water from Pardee Reservoir. Due to the high quality of the Mokelumne Aqueduct water, the Orinda WTP was designed and permitted to operate as an in-line water treatment plant. The Briones Reservoir near the Orinda WTP is used as a supplemental water source when demand is high or when water quality and/or supply issues occur in the Mokelumne Aqueduct from Pardee Reservoir.

The Orinda WTP process train consists of chemical pre-treatment, in-line filtration, and chemical post-treatment. Pre-treatment consists of coagulant and coagulant-aid additions -- polyaluminum chloride (PACl) and cationic polymer -- and sodium hypochlorite addition in the influent. After chemical addition, the water flows to the filters. The plant has a total of 20 gravity dual media filters. After filtration, fluoride, caustic soda and ammonia are added to the water. The filtered water flows by gravity through two pipes (Effluent Pipes #1 and #2) with 95 percent of the water flowing through the Claremont Tunnel and 5 percent serving the nearby water distribution system.

Flow capacity through the plant is set through each individual filter by pre-setting filter effluent valve settings. Water not being processed from the aqueducts is dechlorinated and released into San Pablo Creek which flows into San Pablo Reservoir.

Orinda WTP filter-to-waste backwash water is pumped to one of two washwater settling basins where the supernatant is dechlorinated (using sodium bisulfate) and discharged to San Pablo Creek via the waste discharge channel. Settled sludge is periodically pumped to District trucks and hauled offsite for disposal at the District's Wastewater Treatment Plant.

Process Changes at the Water Treatment Plants

No process change has occurred at the water treatment plants in the 2000-2005 time period. Improvements to the existing processes to improve process capacity and plant efficiency were implemented at Walnut Creek and Camanche North Shore, as discussed earlier in this section.

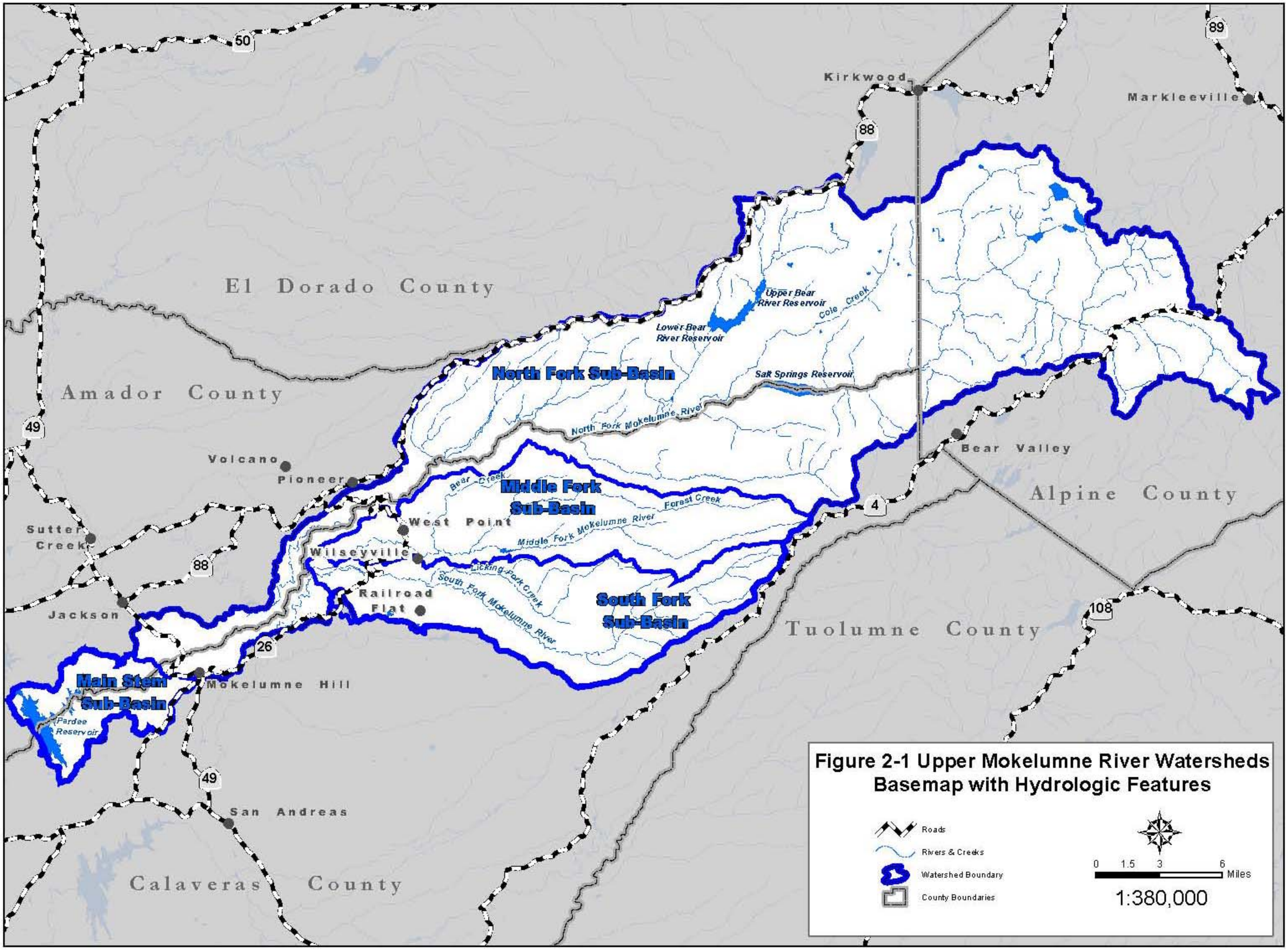


Figure 2-1 Upper Mokelumne River Watersheds Basemap with Hydrologic Features

FIGURE 2-2 – Flow and Distribution Diagram, Year Ending June 30, 2003

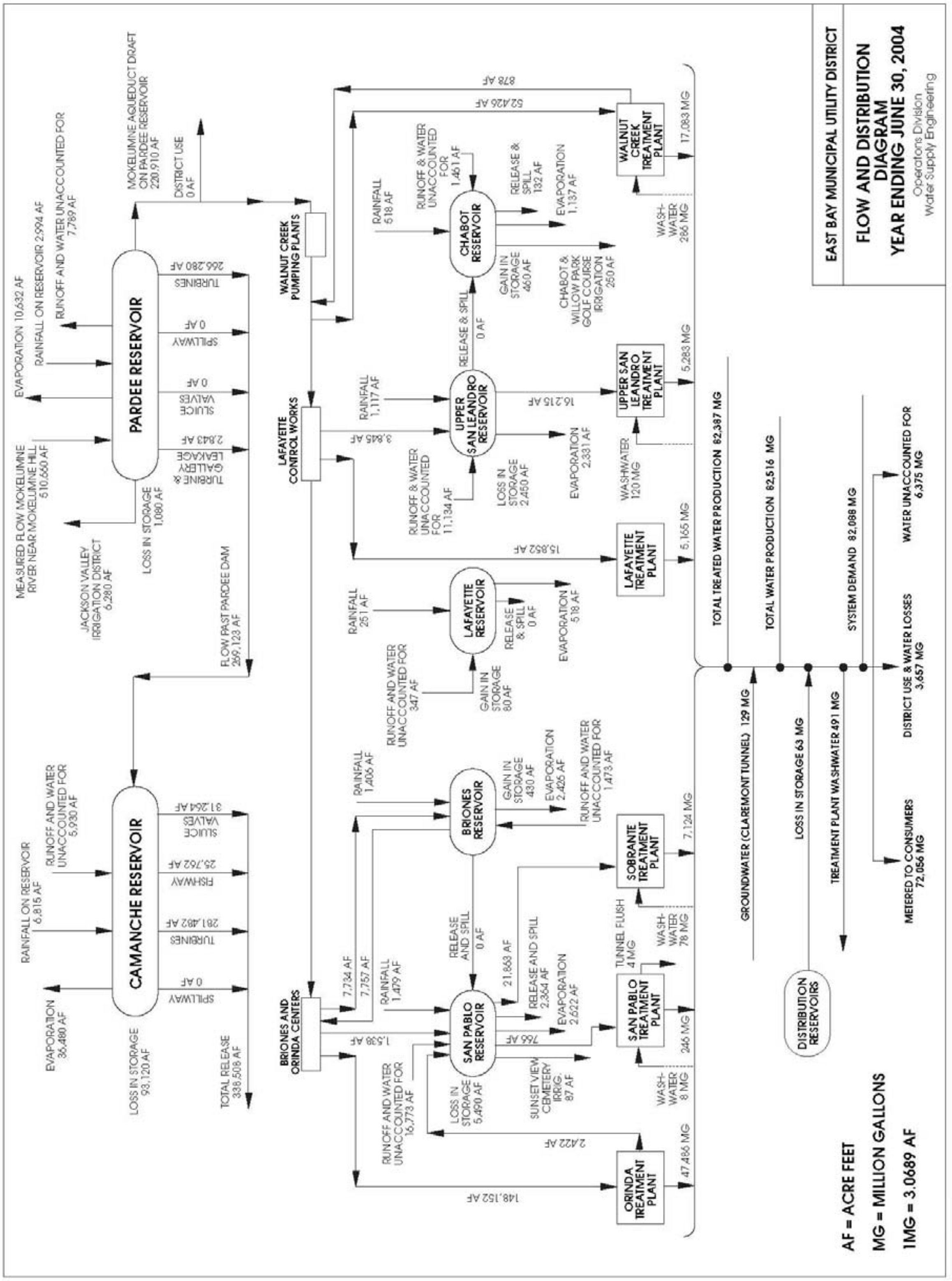


FIGURE 2-3 – Pardee Watershed Facilities

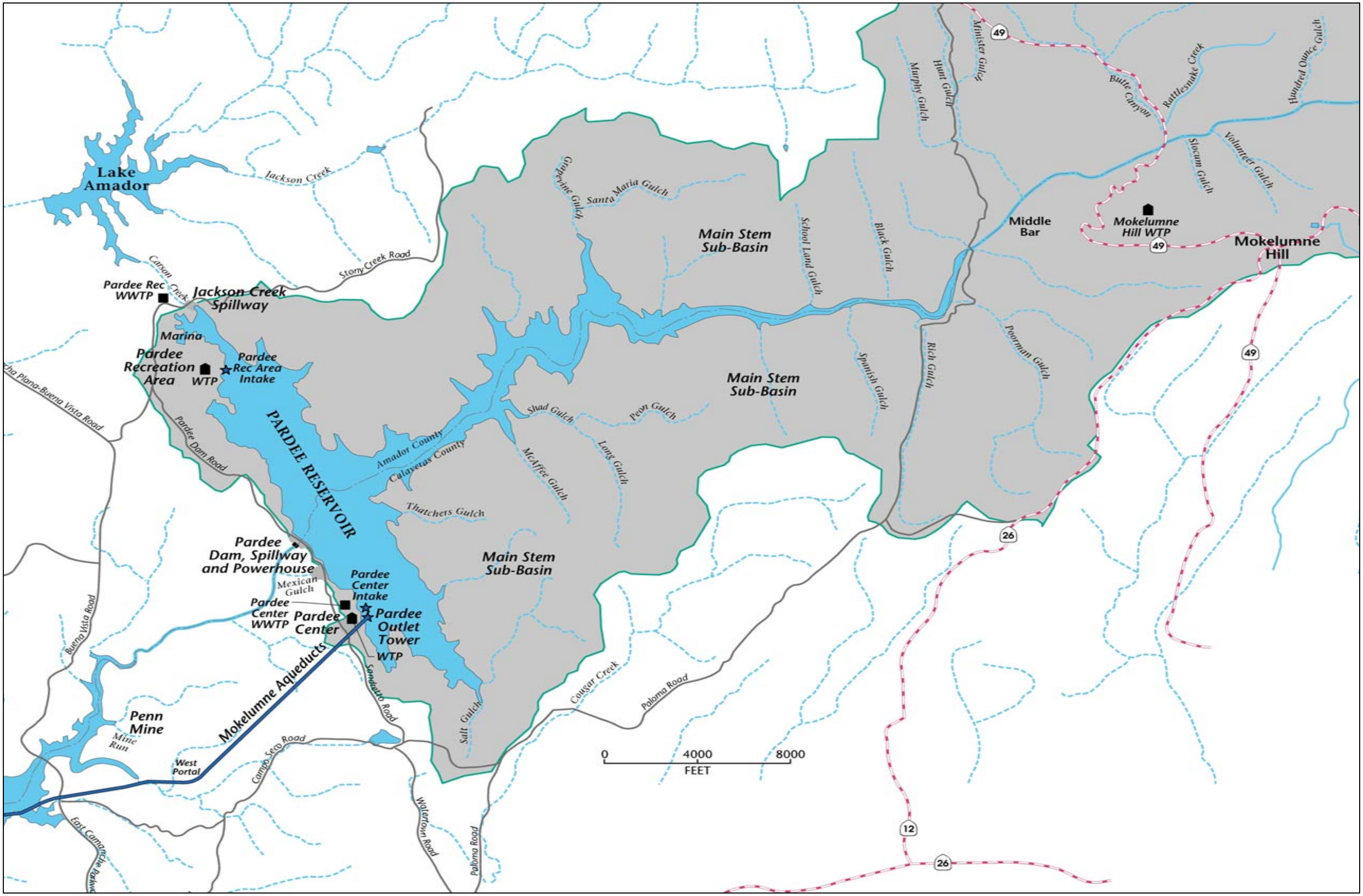
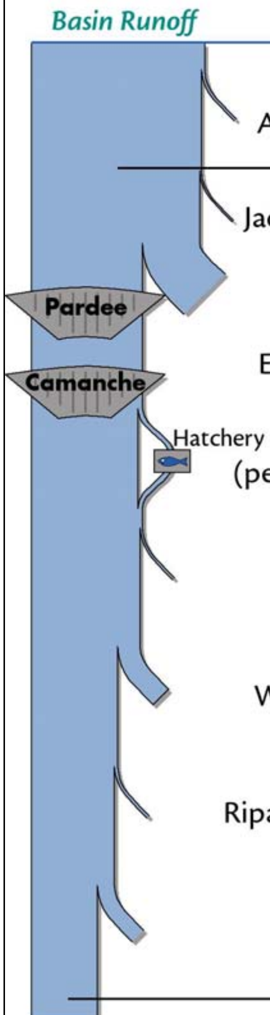


FIGURE 2-4 – Upper Mokelumne River Diversions and Flow

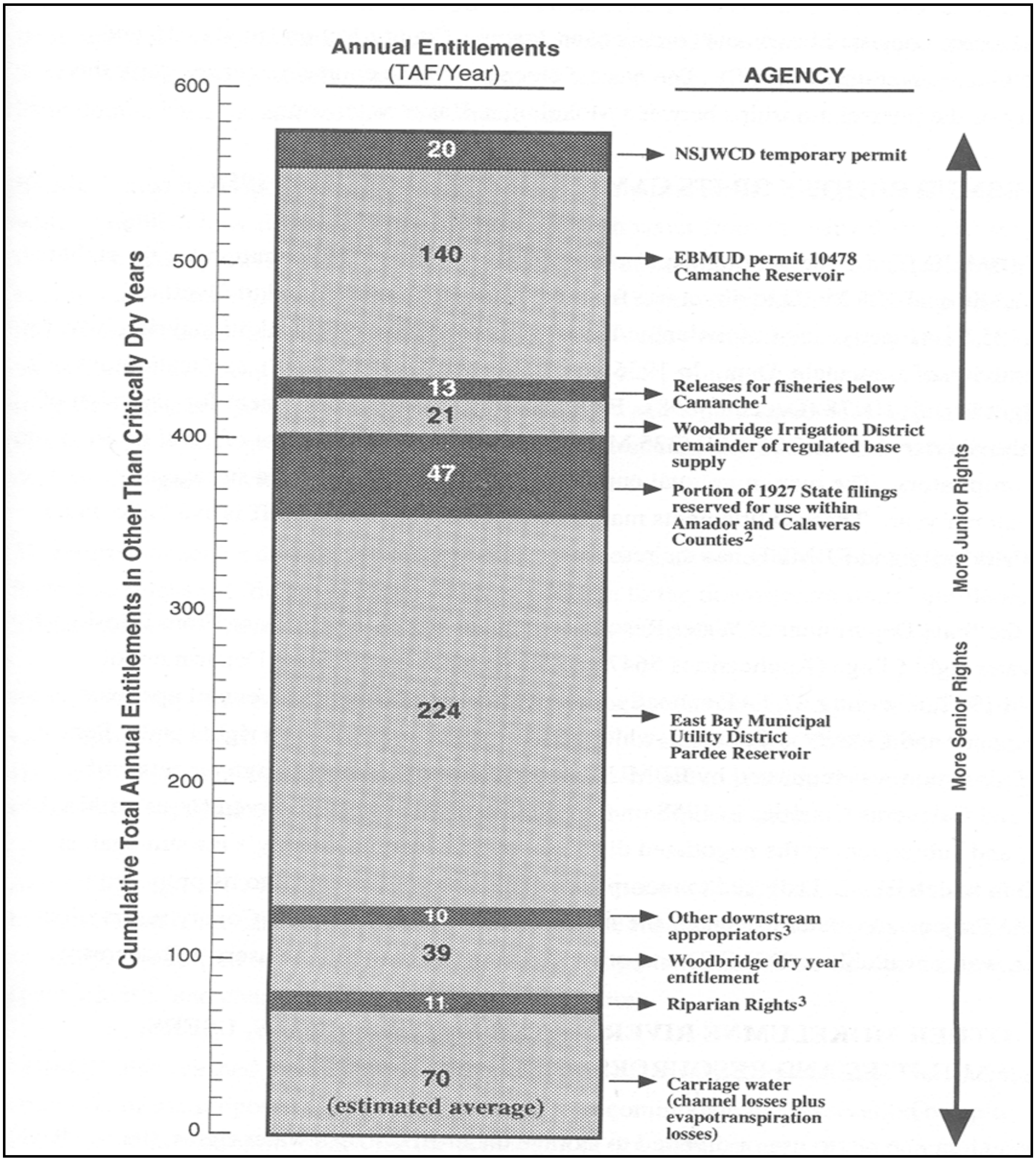


Diversions & Losses	Diversions and Flows (TAF/Year)	
	Maximum	2004 Releases, Diversions And Losses
Amador & Calaveras Counties	47.0	13.1
Mokelumne Hill Gage		**482**
Jackson Valley Irrigation District	3.85	3.85
EBMUD Aqueduct Draft	364.0 (325 MGD)	218
EBMUD Diversions to Storage	562.9	
Camanche Release (per Joint Settlement Agreement)	165.9(1)	287
North San Joaquin Water Conservation District	20.0	2.86
Woodbridge Irrigation District	60.0(2)	59.9
Riparians and Senior Appropriators	20.1	12.2
Net Channel Losses	130.0	56.1
Woodbridge Gage		**156**

Notes: (1) Fish Releases from Camanche are based on a 2020 Level of Development, 228 MGD Level of Demand Model Study per Joint Settlement Agreement.

(2) EBMUD's obligation to release water to the Woodbridge Irrigation District is limited by a series of water rights settlement agreements to a maximum of 60 TAF/yr.

FIGURE 2-5 – Hierarchy of Upper Mokelumne River Water Rights & Other Flow Commitments



NOTES:

1. Fish agreement is related to the Camanche permit.
2. Includes pre-1914 water rights.
3. Total of riparian and other downstream appropriations is estimated to be approximately 21 TAF total (10 TAF appropriations + 11 TAF riparian).

Figure 2-6: Camanche Watershed

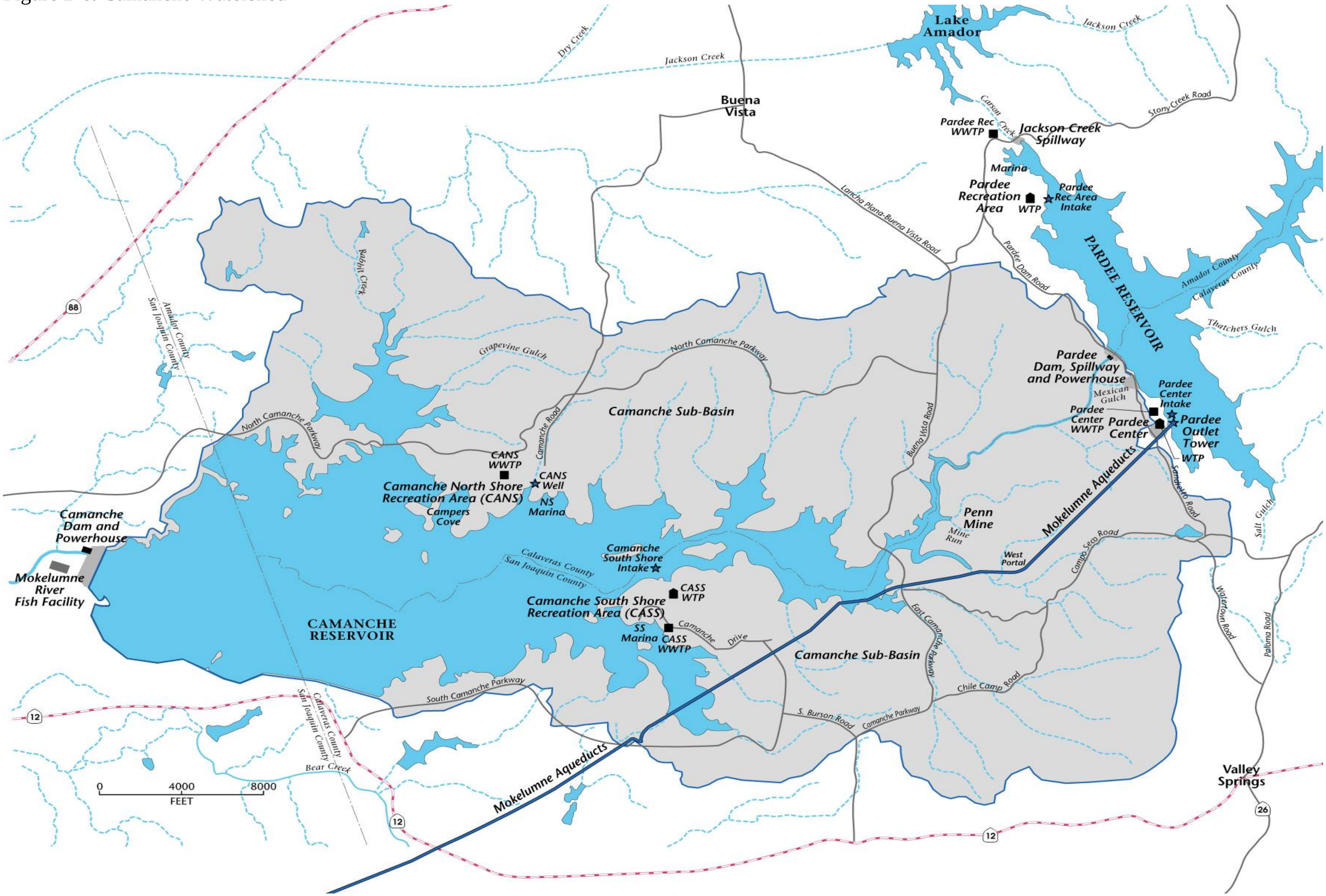
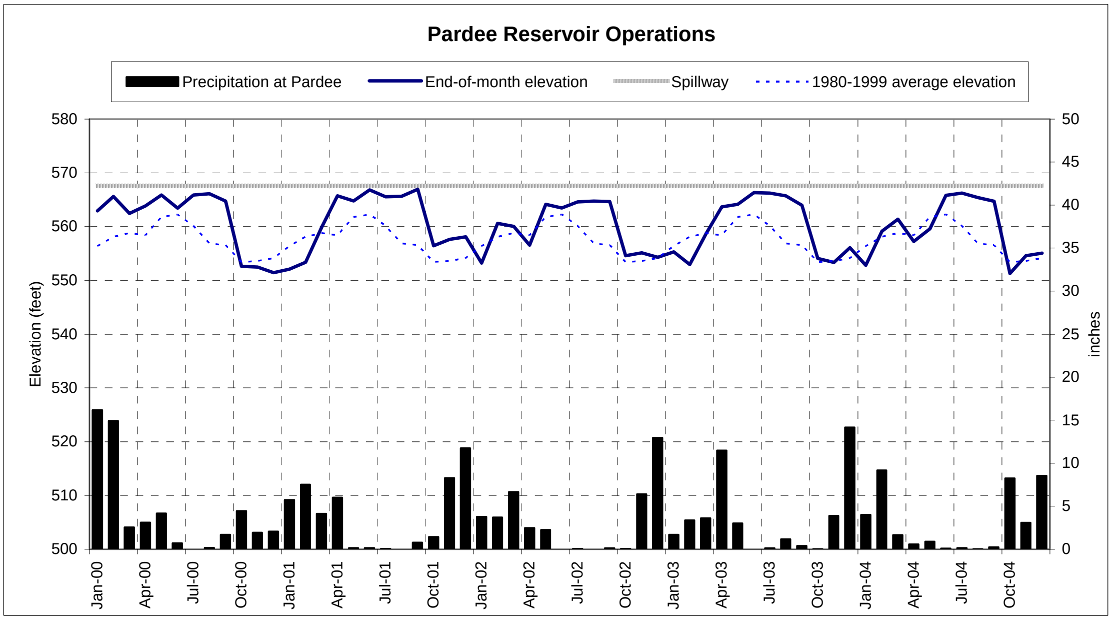
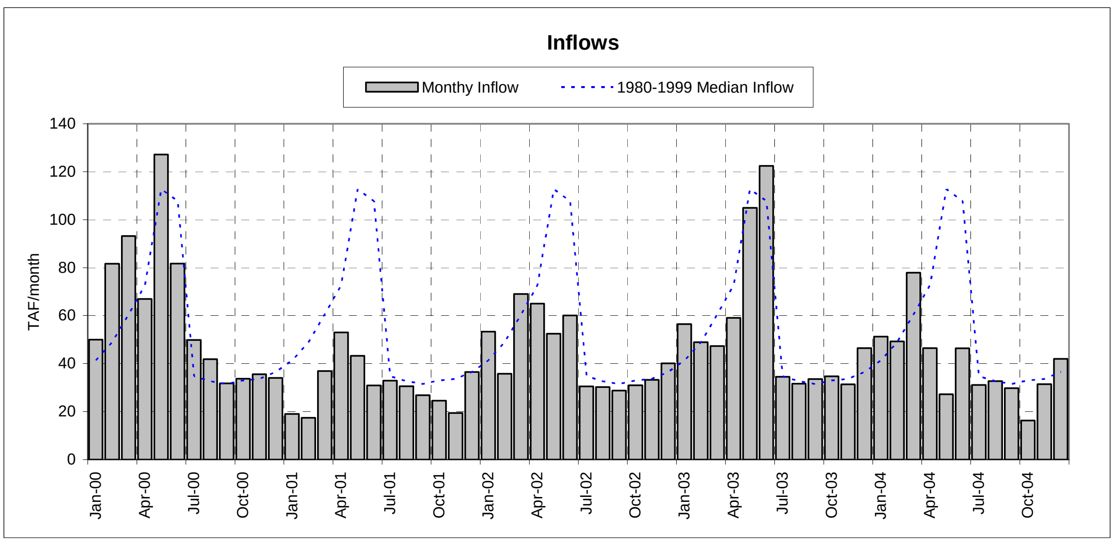


Figure 2-7 Pardee Operations Summary 2000-2004





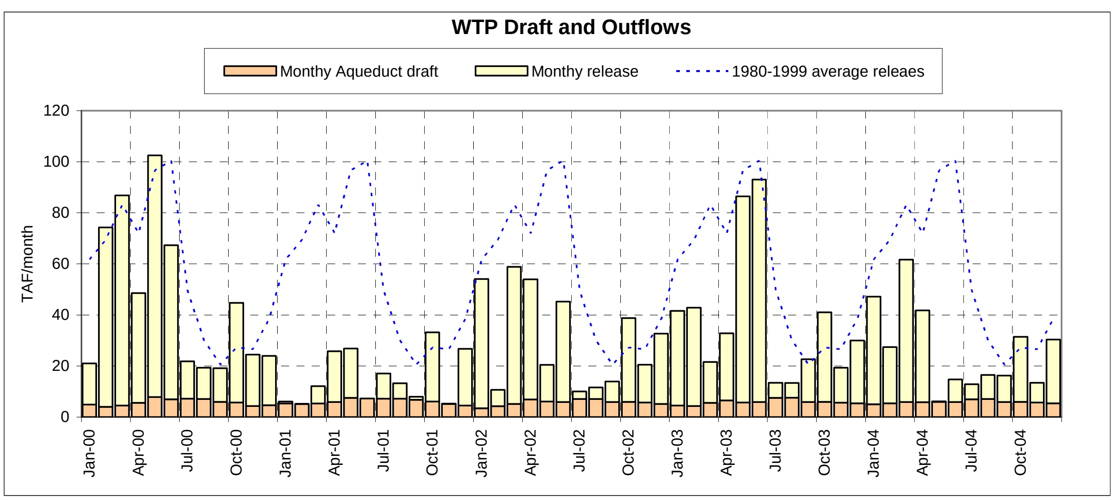


Figure 2-8 Camanche Reservoir Operations 2000-2004

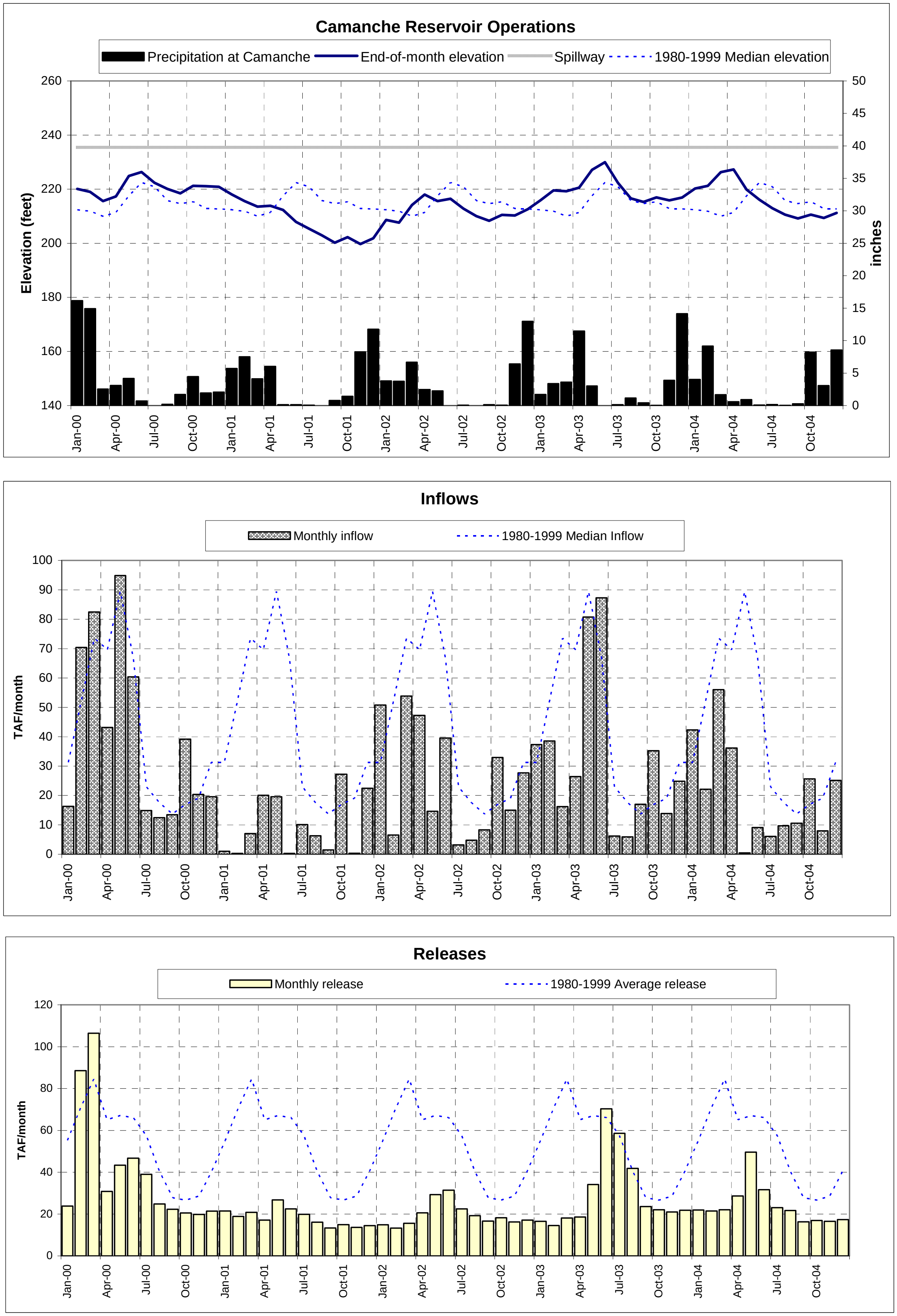


Table 2-1: Present and Future Demands of Agencies Other than the District (By Type of Water Year)

Agency	1990[1]		2020[2]	
	Wet & Normal (ac-ft/yr)	Dry (ac-ft/yr)	Wet & Normal (ac-ft/yr)	Dry (ac-ft/yr)
Amador Water Agency	10,000	10,000	18,040	18,040
Central Amador Water Project	600	600	1,960	1,960
Jackson Valley Irrigation District	3,850	3,850[3]	3,8503	3,850[3]
Calaveras Public Utility District	1,482	1,482	4,910	4,910
Calaveras County Water District	498	498	6,762	6,762
TOTAL	16,430	12,580	31,672	31,672

NOTES:

1 1990 demands represent an average of actual use from 1980 - 1989.
2 Demands based on projected growth.
3 Estimate based on projected shortages in Mokelumne River supplies, no water would be available from this source to satisfy JVID demands.

Source: EDAW, December 1992

Table 2-2: Upper Mokelumne River and Camanche Watershed Storage Reservoir Summary

Storage Reservoir	Operating Agency	Max Capacity (acre-feet)	Dam Crest Length (feet)	Type of Structure	Year Storage Began	Drainage Area (sq. mi)
Upper Blue Lake	PG&E	7,300	837	Earth & Rock Fill	1881	2.7
Lower Blue Lake	PG&E	5,091	1,063	Earth & Rock Fill	1885	4.6
Twin Lake	PG&E	1,207	1,520	Earth & Rock Fill	1898	0.8
Meadow Lake	PG&E	5,656	775	Rock Fill/Gunite Face	1903	5.5
Upper Bear River	PG&E	7,306	1,212	Rock Fill/Gunite Face	1900	28
Lower Bear River	PG&E	52,025	979/865	Rock Fill/Concrete Face	1952	37
Salt Springs	PG&E	141,857	1,257	Rock Fill/Concrete Face	1931	169
Tiger Creek Forebay	PG&E	39	900	Earth Fill	1931	NA
Tiger Creek Regulator	PG&E	533	486	Concrete Slab & Buttress	1931	9
Tiger Creek Afterbay	PG&E	2,607	448	Concrete Arch	1931	357
Lake Tabeaud	PG&E	2,369	636	Earth Fill	1901	0.75
Electra Afterbay	PG&E	40	319	Concrete Gravity	1948	NA
Electra Diversion	PG&E	36	188	Concrete Gravity	1931	NA
Middle Fork (Schaad's)	CPUD	1,700	900	Earth Fill	1939	28.5
Pardee	EBMUD	197,950	1,377	Concrete Arch	1929	578
Camanche	EBMUD	417,120	2,640	Earth & Rock Fill	1963	621

Table 2-3: Camanche North Shore WTP Well System

	Construction Date	Depth	Well Capacity (varies w/head)
Well #1	Not used		
Well #2	1977	320 ft.	90 gpm max.
Well #3	1979	228 ft.	90 gpm max
Well #4	1997	420 ft.	50 gpm max

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Background

The Upper Mokelumne River and Camanche Watersheds lie on the western slope of the Sierra Nevada Mountains in Alpine, Amador, Calaveras, and San Joaquin counties. The total area of the watersheds is 627 square miles, and extending from Highland Peak (elevation 10,934 ft) near the crest of the Sierras to Camanche Reservoir (crest elevation 235 ft) located in the lower western foothills near Clements. Most of the watershed is forested land within the Eldorado and Stanislaus National Forests.

Natural Resources of the Upper Mokelumne River Watershed

The 2000 Mokelumne Watershed Sanitary Survey contained detailed descriptions of the Upper Mokelumne Watershed geology, soils, vegetation, wildlife, hydrology, general land use, ownership and jurisdictions. This section contains a brief summary of these previous write-ups, and notes any changes. In the hydrology section, graphs have been added to show river flows during the update period compared to historic flows. Summaries of climate data for four upper-basin stations used by the District have also been added.

Location

The Upper Mokelumne River Watershed is composed of the lands above Pardee Dam, which drain to Pardee Reservoir. The Upper Mokelumne River Watershed encompasses 578 square miles in Alpine, Amador, and Calaveras counties. Figure 2-1 depicts the sub-watersheds and hydrologic features. Descriptions of the sub-basins are in discussed under "Drainage Basins" in this section.

Geology

The Upper Mokelumne River Watershed is located in the Sierra Nevada Geomorphic Province and is characterized by three major lithologic groups -- Paleozoic metamorphic rocks, granitic rocks of the Sierra Nevada batholith, and Tertiary volcanic rocks. A general geologic map of the watershed can be found in the 2000 Mokelumne Watershed Sanitary Survey, page 3-5.

A series of northwest trending faults form a 30- to 50-mile-wide band of rocks that parallels the Sierra Nevada Range. Collectively called the Foothills fault system, the faults can be subdivided into two fault zones -- the Bear Mountains and Melones zones. The area has little recent history of fault movement and few epicenters larger than 3.5 have occurred in the area since 1910.

Soils

The North, Middle, and South Forks of the Upper Mokelumne River Watershed, have shallow-to-deep, medium-textured-to-stony soils. Most have weathered from metasedimentary or granitic rock, and are located in a variety of topographic settings ranging from ridge tops to steep canyon sides. Soils found in the Mainstem Mokelumne River sub-watershed consist of generally shallow to moderately deep, medium-textured and stony soils. Most are weathered from fractured metamorphic rocks and granite. Deep loamy soils have developed on gently rounded ridges underlain by granitic rocks, on occasional gently sloping table-top ridges underlain by volcanic flow deposits, and on sharp ridges underlain by schists and slates.

Vegetation

The Upper Mokelumne River Watershed features vegetative communities typical of the Sierra Nevada Mountains and foothills. For a map of the major vegetative communities in the watershed, please refer to page 3-11 in the 2000 Mokelumne Watershed Sanitary Survey. A detailed assessment of vegetation communities can also be found Sierra Pacific Industries Watershed Assessment (2000).

Ponderosa pine predominates on dry sites between 2,000 and 5,000 feet in elevation. Black oak is abundant in the lower canyons. Mixed conifers are most common in moist areas between 3,000 and 6,000 feet. White fir is the most common coniferous species of northern exposures at the higher elevations. Open annual grasslands, dense oak woodlands, and oak savannah communities are common at the lower elevations. Sub-dominant vegetation types include chaparral and riparian scrub communities. Canyon chaparral, which is limited by the steep, rocky terrain of the canyon walls, includes Mariposa manzanita, buckbrush, and poison oak.

The banks of the Mokelumne River and its perennial tributaries support the bulk of the Upper Mokelumne River Watershed riparian vegetation, although several of the ephemeral tributaries support minor riparian communities. The riparian zones are limited to narrow strips along waterway embankments. Hydrophilic, deciduous trees and shrubs, such as alders, dogwoods, and willows, are typical of the riparian communities.

Wildlife

The Eldorado National Forest provides habitat for about 340 species of wildlife. This total includes 202 bird species, 79 mammal species, 20 fish species, 24 reptile species, and 15 amphibian species. The Stanislaus National Forest provides habitat for about 343 wildlife species. Reptiles, amphibians, birds, fish and mammals of all size ranges are located in the aquatic and upland communities of the Upper Mokelumne River Watershed. Some of the larger mammals include the mountain lion, black-tailed deer, and black bear. Smaller mammals include the western grey squirrel, racoon, muskrat and brush rabbit. More details regarding these mammals and other wildlife are provided in Section 5 - Potential Contaminant Sources.

As documented in the watershed assessment conducted by Sierra-Pacific, 33 wildlife species -- 7 amphibian and reptile species, 13 bird species, 1 fish species, 5 mammal species, and 7 invertebrate species -- of special status and/or concern potentially occur in the Upper Mokelumne River Watershed. The principal sources consulted for the description of target species -- special status species -- included the California Natural Diversity Database (CNDD), California Wildlife Habitat Relationships, publications by California Native Plant Society, reports on Status of Sierra Nevada and other relevant references. Of the 33 special status wildlife species potentially occurring in Upper Mokelumne River Watershed, 10 species are listed as federal and/or state endangered or threatened species. These endangered or threatened species include the California red-legged frog, bald eagle, great gray owl, willow flycatcher Lahontan cutthroat trout, Sierra Nevada red fox, California wolverine, vernal pool fairy shrimp (2 sub-species), and valley elderberry longhorn beetle.

Drainage Basins

Above Pardee Dam, the watershed encompasses an area of approximately 578 square miles. This area is divided into four sub-basins: the North Fork (370 sq. mi.), Middle Fork (80 sq. mi.), South Fork (79 sq. mi), and the Main Stem (~50 sq. mi). The watershed is approximately 60 miles long, and ranges from 1.5 to 17 miles in width. The North Fork is the major tributary, flowing some 55 miles from its source at the crest of the Sierras to its confluence with the Middle Fork near West Point. Elevations within the North Fork sub-watershed range from 10,430 feet at Round Top Peak to 900 feet at the confluence with the Middle Fork. The Middle Fork of the Mokelumne River flows about 22 miles from its headwaters in Stanislaus National Forest at elevation 7,200 feet to join the North Fork at elevation 900. The South Fork flows about 24 miles from its headwaters in Stanislaus National Forest near elevation 7,000 feet to its confluence with the Middle Fork about one mile upstream of its confluence with the North Fork at about elevation 1,200. The Mainstem of the Mokelumne River begins 17 miles upstream of Pardee Dam at the confluence of the North and Middle Forks. It flows in a narrow valley, past PG&E's Electra Powerhouse, under Highway 49 near the community of Mokelumne Hill, and into Pardee Reservoir about two miles downstream of the Highway 49 bridge. Elevations within the Mainstem sub-watershed range from 3,012 feet to 570 feet at Pardee Reservoir.

Precipitation and Evaporation

Figure 3-1 shows the locations of important climate stations for the Upper Mokelumne River Watershed. Figures 3-2 shows average monthly rainfall and temperatures at Pardee Reservoir for the period of record to 2004, since 1930 and 1953, respectively. Figures 3-3a to 3-3c show the same information for other climate stations at different elevations in the Upper Watershed with their starting years noted below each graph. More discussion of historic precipitation and climate can be found in the 1995 and 2000 Mokelumne Watershed Sanitary Surveys.

Winter precipitation above 5,000 feet elevation usually occurs as snow, while at lower elevations precipitation occurs more commonly as rain or sleet. Most of the Middle Fork, South Fork, and Mainstem sub-basin area lays below 5,000 feet elevation. Cumulative seasonal snowfalls above 6,000 feet typically approach 400 inches, with compacted snow depths attaining 100 inches or more at densities varying from 35 to 50 percent water.

Local Runoff and Diversions

Streamflow in the Mokelumne River is modified by upstream diversions and regulated by reservoir storage operations for hydroelectric power generation and water supply as discussed in Section 2. PG&E operates a network of storage reservoirs and diversion facilities on the North Fork. The Amador Water Agency diverts Mokelumne River water through the Amador Canal and from the Tiger Creek Afterbay to its Central Amador Water Project. Jackson Valley Irrigation District receives water from the Amador Canal and from Pardee Reservoir. Calaveras Public Utility District owns and operates Schaads Reservoir on the Middle Fork and diverts water into Jeff Davis Reservoir -- 2,000 ac-ft capacity of off-stream storage -- for treatment and distribution to customers. Figure 3-4 depicts the diversions and storage of Mokelumne River water in the Upper Mokelumne River Watershed.

Section 3 in theMRWSS Update 2000 showed mean monthly flows and exceedence probabilities for the Mainstem, Middle Fork, and South Forks of the Mokelumne River. This information was expanded by plotting flows during the update period, along with historic true natural flows in the

Mainstem. These plots are shown in Figure 3-5 along with flows in the Middle and South Forks. Locations of the USGS flow recording stations are shown in Figure 3-1.

Land Uses

The Upper Mokelumne River Watershed comprises approximately 370,000 acres (578 square miles). The vast majority of this upper watershed consists of open-space and forestland with large tracts of designated wilderness and small concentrations of residential development. There are only very small amounts of agriculture -- mainly orchards and vineyards -- and a few areas dedicated to recreational development. There are very few areas devoted to industrial or commercial use. Table 3-1 summarizes the predominant land uses identified within Upper Mokelumne River Watershed. Figure 5-4 complements Table 3-1 by depicting the spatial distribution predominant land uses identified.

Most of the intensively developed areas within the Upper Mokelumne River Watershed are residential communities. As shown in Figure 5-4, the majority of these areas are located in the lower elevations of the sub-watershed areas of the Middle Fork, South Fork, and Mainstem of the Mokelumne River. These intensively developed areas are continuing to grow due to population growth. As noted in the 1995 MRWSS, the foothill and mountain counties of California have experienced an unexpectedly rapid population growth surge. The counties of Upper Mokelumne River Watershed -- Alpine, Amador, and Calaveras -- are no exception. Table 3-2 summarizes both historical and projected watershed populations by county for the decades from 2000 through 2050. Population figures were also updated using 2000 census data and more current projections from the California Department of Finance. Amador and Calaveras County growth rates over the 1990-2000 decade were 14% and 26% respectively, which lagged behind projections and population increases in excess of 50% experienced from 1980-1990. Current growth projections are around 2% per year.

The county-wide population growth rates may not be representative of growth within the Upper Mokelumne Watershed. Most of the fast-growing areas in Amador and Calaveras counties fall outside the watershed boundaries. Using a 2000 Census GIS dataset overlaid on the watershed boundary, estimated populations within the Upper Mokelumne River Watershed and each of the sub-watersheds were compiled in Table 3-3. The totals for the watershed are estimated at 5,923 persons living in 3,475 homes. .

Landownership and Jurisdictional Authority

Including the District, six major institutional landowners and 81 major private landowners have been identified in the Upper Mokelumne River Watershed. The major landowners are listed in Table 3-4. Of these landowners, District property accounts for about 3%, Sierra Pacific Industries owns approximately 24 percent of the land, Bureau of Land Management approximately 3 percent, PG&E approximately 1 percent, National Forest Service approximately 54 percent, and others approximately 15 percent.

The names of the 81 private landowners within the Upper Mokelumne River Watershed with more than 160-acre holdings are listed in Table 3-4. In addition to these landowners, there are three counties -- Alpine, Amador, and Calaveras -- and four utilities -- Amador County Water Agency, Calaveras County Public Utility District, Calaveras County Water District, and Jackson Valley Irrigation District -- with major jurisdictional authority. Jurisdictional authority is important to the District in managing watershed lands, particularly with the lands, which are not owned by the District. Land use controls for water quality protection are an important management technique, which are discussed in Section 6.

Natural Resources of the Camanche Watershed

Camanche Watershed is composed of the lands above Camanche Dam and below Pardee Dam, which drain toward Camanche Reservoir. The 2000 Mokelumne Watershed Sanitary Survey contained detailed descriptions of the Camanche Watershed geology, soils, vegetation, wildlife, hydrology, general land use, ownership and jurisdictions. This section contains brief summary information in the 2000 survey, and any changes.

Location

The Camanche Watershed is approximately 42 square miles, draining lands to the north and south of the lower Mokelumne River and immediately to the west of Pardee Reservoir. It is bounded on the west by Camanche Dam.

Geology and Soils

The topography of the watershed varies from the gently sloping plain of the eastern San Joaquin Valley to the gentle and moderately rolling hills and ridges of the western-most Sierra Nevada foothills. Elevations range from 235 feet above Mean Sea Level (MSL) to about 700 feet MSL on the ridge-crests adjacent to Pardee Dam. The most noticeable outcroppings are comprised of Mehrten Formation lahar deposits. This formation generally overlies older sediments. Mehrten Formation generally consists of an upper, soft volcanoclastic layer with interbedded sediments; middle, resistant volcanoclastic unit and a lower unit of light-colored ashy tuff.

Major soil groups in the watershed include well-drained stony clays to stony silt loams, well-drained gravelly to cobbly loams, well-drained clays occupying moderate slopes, relatively young overlying soil deposits consisting of well-developed alluvia with resistant hardpans, and unconsolidated to slightly-consolidated alluvia. Small, valley-side deposits consist of alluvial fans, landslides, and very recent in-channel deposits. All exposed sedimentary rocks and soils are subject to erosion and transport into the reservoir, largely as a function of slope. The presence of vegetation is a major factor in the prevention of erosion. Local sediments are the primary source of inorganic turbidity.

Vegetation and Wildlife

The Camanche watershed vegetation can be classified primarily as blue oak woodland and annual grassland. Blue oak woodland is dominated by blue oaks, commonly forming open savanna-like stands on dry ridges and gentle slopes. Shrubs may be present but are rarely extensive, often occurring on rock outcrops. Associated shrub species include poison oak, California coffeeberry, buckbrush, redberry, California buckeye, and manzanita. Typical understory is composed of annual grassland vegetation such as bromegrass, wild oats, foxtail, filaree, fiddleneck and other non-native annuals. Blue oak woodland usually intergrades with annual grasslands or valley oak woodlands at lower elevations and blue oak-grey pine woodlands at higher elevations.

Annual grasslands are dominated by introduced annual grasses, including wild oats, ripgut grass, foxtail chess, wild barley, and foxtail fescue. Common forbs include broadleaf filaree, redstem filaree, turkey mullein, clover, bur clover, popcorn flower and California poppy.

Blue oak woodlands and annual grasslands in the western Sierra Nevada support numerous species of amphibians, reptiles, birds and mammals. The Camanche watershed provides habitat for about 303 species of wildlife, including 176 bird species, 67 mammal species, 26 fish species, 22 reptile species and 12 amphibian species. The area potentially supports 37 species classified as special status species – 3 invertebrates, 1 fish, 6 amphibians, 2 reptiles, 21 birds and 4 mammals. Those special status species listed as endangered and/or threatened include the vernal pool fairy shrimp, vernal pool tadpole shrimp, valley elderberry longhorn beetle, hardhead, California red-legged frog, California tiger salamander, bald eagle, Swainson's hawk, and bank swallow.

Drainage Basins

The hydrologic drainage pattern of Camanche Watershed was shown in Figure 2-6 in the previous section. All local streams -- except Mokelumne -- are ephemeral, and the only named streams in clockwise order from Camanche Dam are Rabbit Creek and Camanche Creek. Unnamed streams occupy China Gulch, a draw that passes through the community of Campo Seco, and Chile Camp Gulch.

Precipitation and Evaporation

EBMUD collects monthly precipitation (rainfall) and evaporation data at the District's Camanche North Weather Station. Average monthly rainfall and temperatures shown on Figure 3-7. Almost 90 percent of the precipitation occurs as rainfall during the months of November through April. Snowfall is extremely rare.

Local Runoff and Diversions

As previously mentioned the local streams are ephemeral and; therefore, do not carry flows during most of the year. High flows occur only during periods of significant runoff produced by major frontal storms. Total annual runoff volumes are relatively small and are not individually quantified -- only aggregate volumes are estimated for the watershed. Based on studies of similar intermittent foothill streams, which are proximate geographically, instantaneous peak flows are expected to be of relatively short duration and approximately two orders of magnitude larger than their mean flows.

No storage reservoirs or natural impoundments other than Camanche Reservoir are present in the watershed except in the northeast corner of the basin. Ten small but permanent ponds and impoundments and at least one ephemeral pond are present in this quadrant. Some of these are connected to the natural drainage courses and some are confined to natural or quarried depressions. Most of these depressions appear to be the products of historical mining and quarrying activities.

Releases from Pardee Dam flow into Camanche Reservoir. These releases averaged 565,780 acre-feet per year from 1974 through 1999. Local runoff for the Camanche Watershed is computed based on natural runoff, rainfall on the reservoir, and unaccounted for water between Pardee and Camanche dams. This runoff averaged 53,450 acre-feet per year between 1974 and 1999. Groundwater resources are adequate within Camanche Watershed and are used as a source for drinking water at the Camanche North Shore Recreation Area.

Land Uses

Camanche Reservoir comprises the majority land use within Camanche Watershed (Figure 2-6). The remaining area is comprised of open-space, agricultural areas and localized urban areas adjacent to the District's recreational facilities. The major transportation corridors include Highway 12 and the secondary roads leading to Camanche North Shore and Camanche South Shore Recreation Areas.

Landownership and Jurisdictional Authority

Including Camanche Reservoir and Camanche North Shore and South Shore Recreation Areas, the District owns approximately 47% of the lands within the Camanche Watershed. The majority of the remaining land (open-space) is owned by the Bureau of Land Management. The watershed basin encompasses portions of three counties – Amador, Calaveras and San Joaquin.

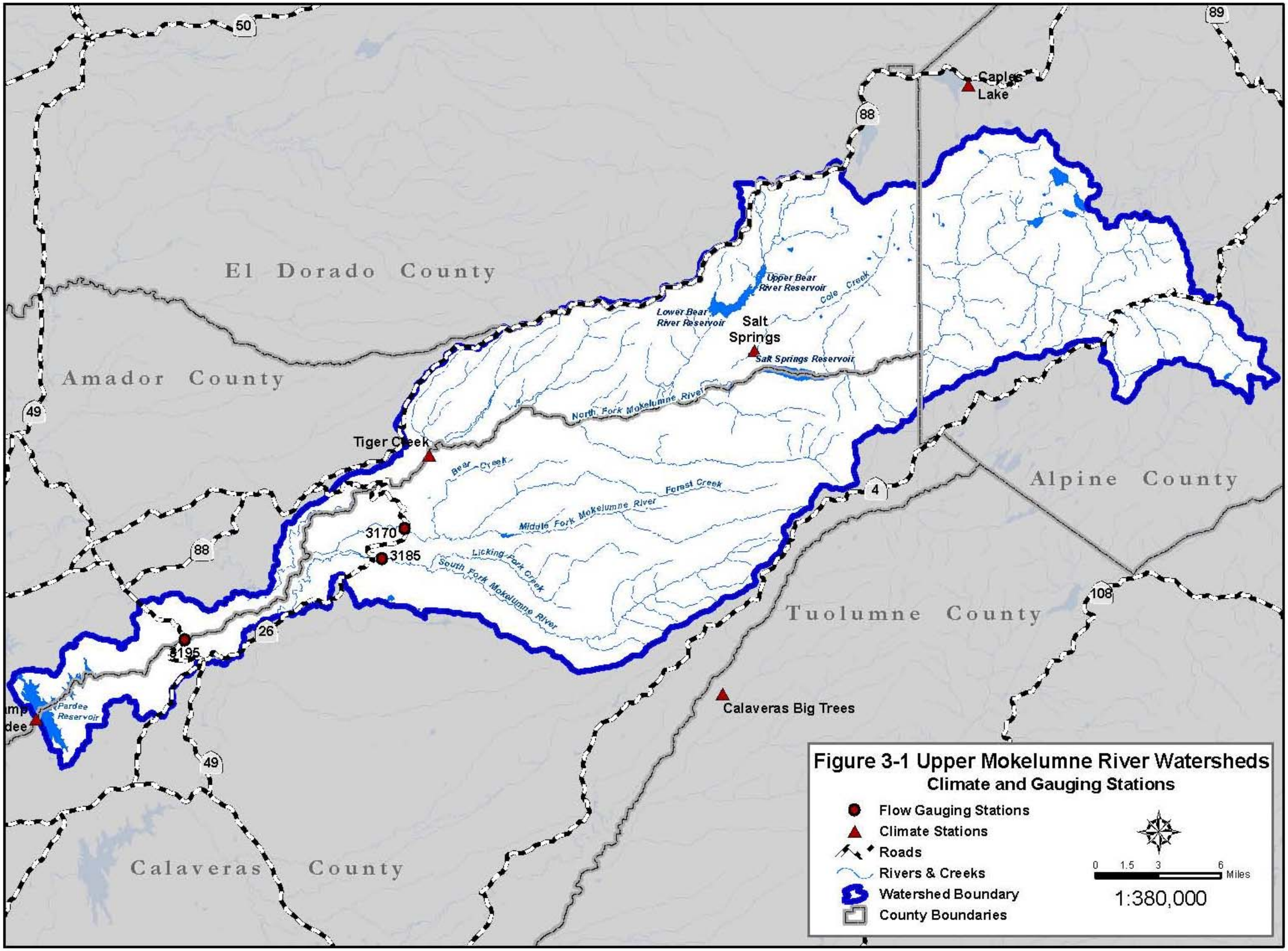
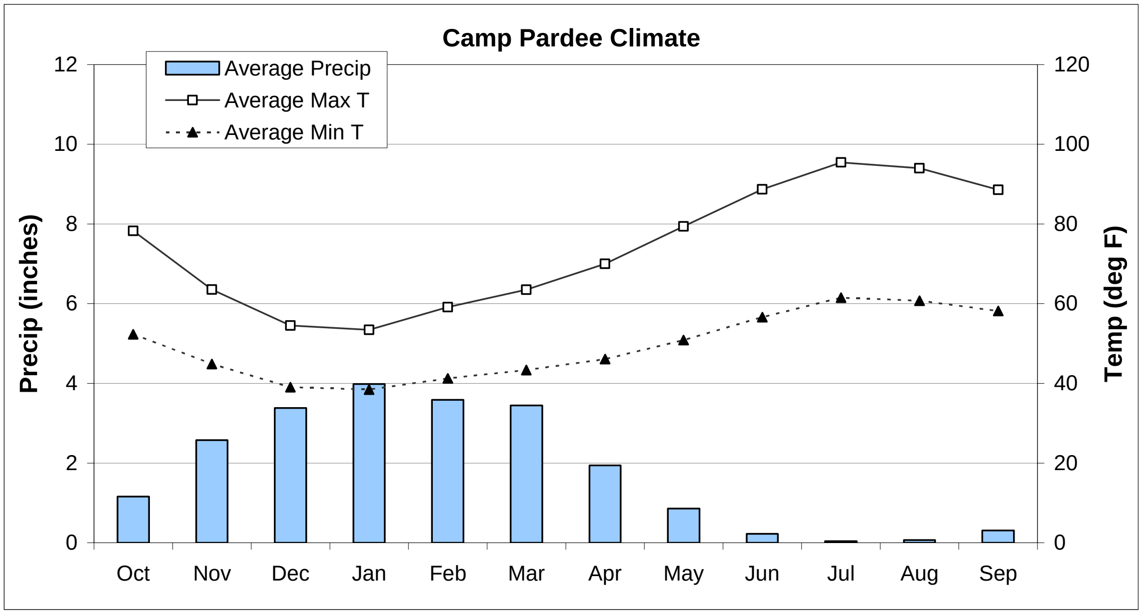


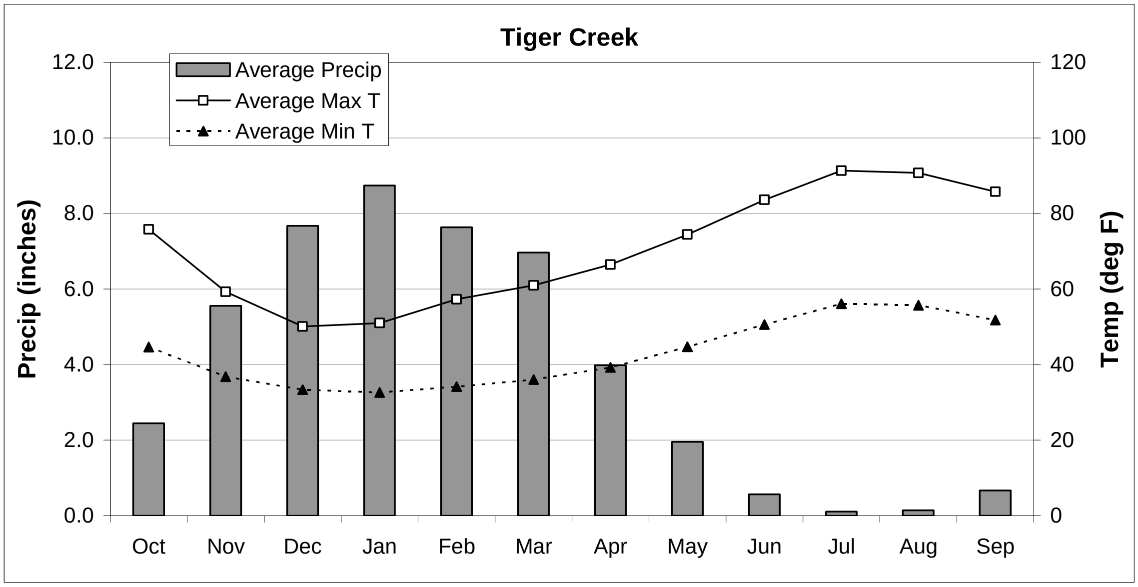
Figure 3-1 Upper Mokelumne River Watersheds
Climate and Gauging Stations
Flow Gauging Stations
Climate Stations
Roads
Rivers & Creeks
Watershed Boundary
County Boundaries
0 1.5 3 6 Miles
1:380,000
El Dorado County
Amador County
Alpine County
Tuolumne County
Calaveras County
Caples Lake
Salt Springs
Salt Springs Reservoir
Upper Bear River Reservoir
Lower Bear River Reservoir
Cole Creek
North Fork Mokelumne River
Tiger Creek
Bear Creek
Forest Creek
Middle Fork Mokelumne River
Licking Fork Creek
South Fork Mokelumne River
3170
3185
3195
Pardee Reservoir
Calaveras Big Trees
50
89
88
49
4
26
108

FIGURE 3-2 Pardee Climate

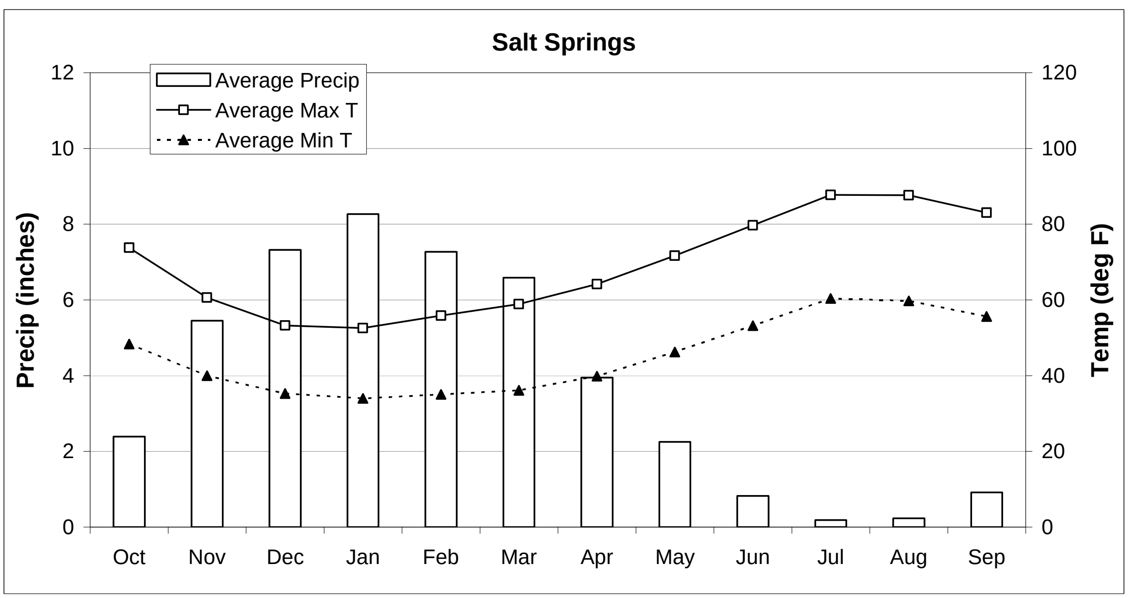


Monthly Avg.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Record
Precipitation	1.2	2.6	3.4	4.0	3.6	3.4	1.9	0.9	0.2	0.0	0.1	0.3	21.6	1930-
Max Temp	78	64	55	53	59	63	70	79	89	95	94	89		1953-
Min Temp	52	45	39	38	41	43	46	51	57	61	61	58		1953-

Figure 3-3a Upper Mokelumne Watershed Climate (Tiger Creek and Salt Springs Stations)

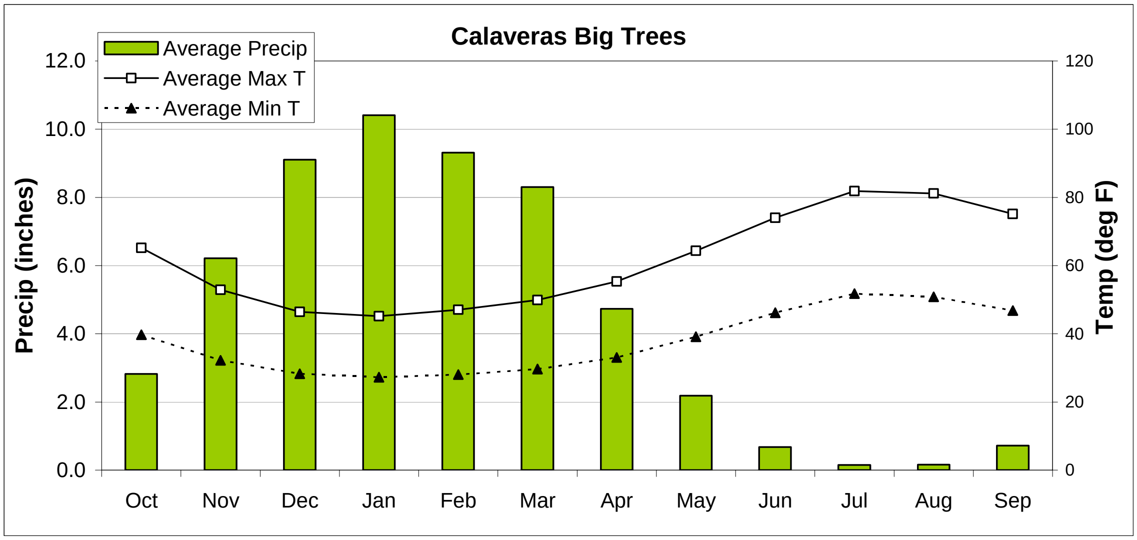


Monthly Avg.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Record
Precipitation	2.4	5.6	7.7	8.7	7.6	7.0	4.0	2.0	0.6	0.1	0.1	0.7	46.4	1930-
Max Temp	76	59	50	51	57	61	66	74	84	91	91	86		1949-
Min Temp	45	37	33	33	34	36	39	45	51	56	56	52		1949-

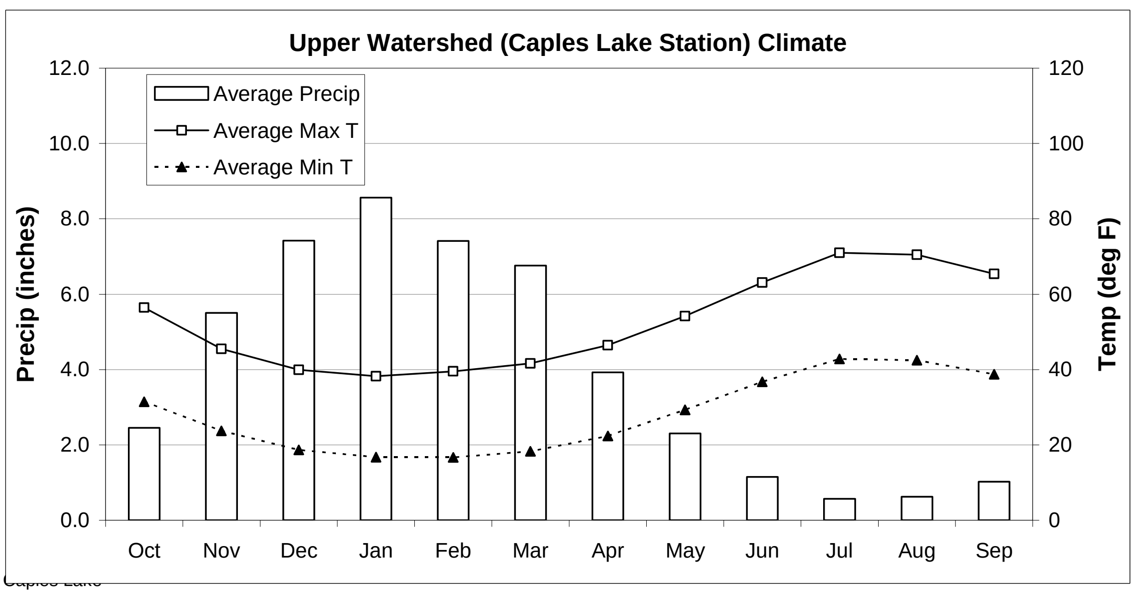


Monthly Avg.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Record
Precipitation	2.4	5.4	7.3	8.3	7.3	6.6	3.9	2.2	0.8	0.2	0.2	0.9	45.65	1930-
Max Temp	74	61	53	53	56	59	64	72	80	88	88	83		1949-
Min Temp	48	40	35	34	35	36	40	46	53	60	60	56		1949-

Figure 3-3b Upper Mokelumne Watershed Climate (Calaveras Big Trees and Caples Lake Stations)

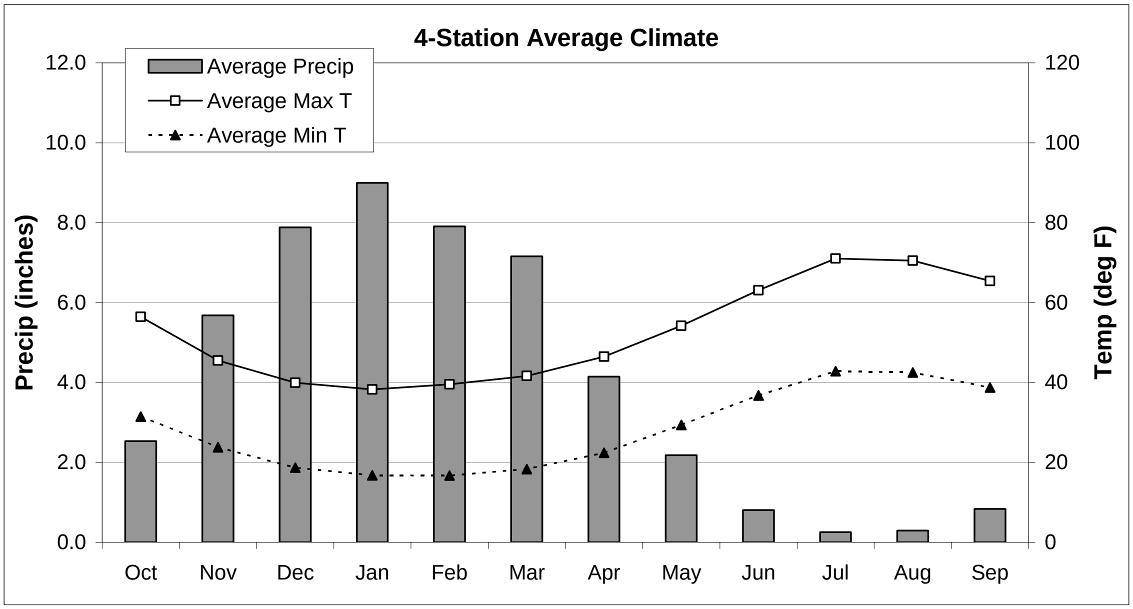


Monthly Avg.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Record
Precipitation	2.8	6.2	9.1	10.4	9.3	8.3	4.7	2.2	0.7	0.1	0.2	0.7	54.8	1930-
Max Temp	65	53	46	45	47	50	55	64	74	82	81	75		1949-
Min Temp	40	32	28	27	28	30	33	39	46	52	51	47		1949-

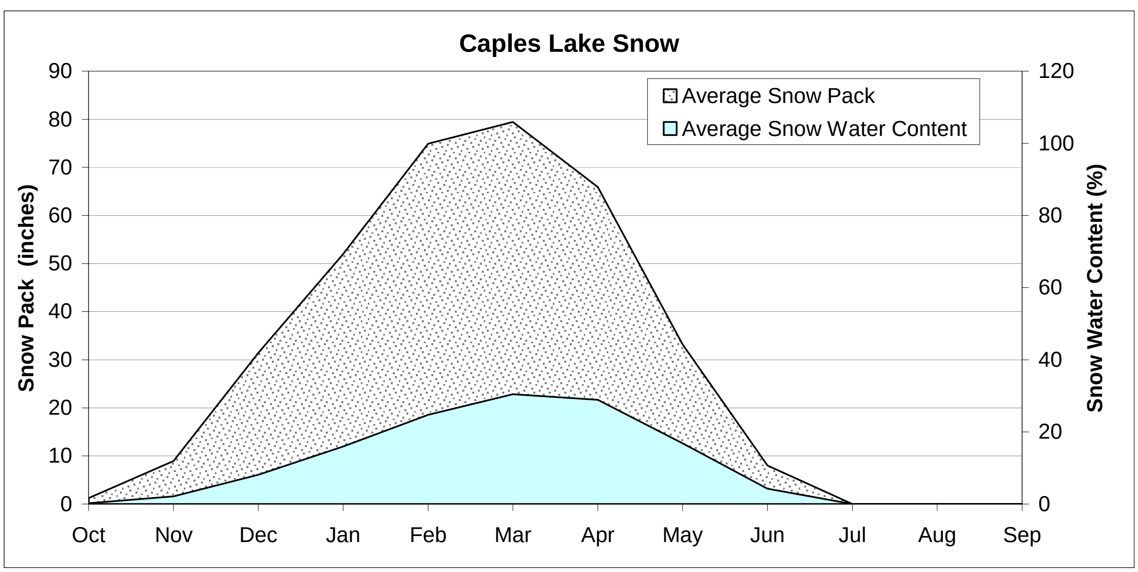


Monthly Avg.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Record
Precipitation	2.5	5.5	7.4	8.6	7.4	6.8	3.9	2.3	1.2	0.6	0.6	1.0	47.72	1930-
Max Temp	56	45	40	38	40	42	46	54	63	71	70	65		1949-
Min Temp	31	24	19	17	17	18	22	29	37	43	42	39		1949-

Figure 3-3c Upper Mokelumne Watershed Climate (4-Station Average, Caples Snow)



Monthly Avg	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Record
Precip (in.)	2.5	5.7	7.9	9.0	7.9	7.2	4.1	2.2	0.8	0.3	0.3	0.8	48.7	1930-
Max Temp (˚F)	68	55	47	47	50	53	58	66	75	83	83	77		1949-
Min Temp (˚F)	41	33	29	28	28	30	34	40	47	53	52	48		1949-



Monthly average	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Record
Snow Pack (inches)	1	9	31	52	75	79	66	33	8	0	0	0	1992-
Water Content (%)	0.2	2.1	8.1	16	25	30	29	17	4	0	0	0	1992-

FIGURE 3-4 - Mokelumne River Releases, Diversions, and Losses

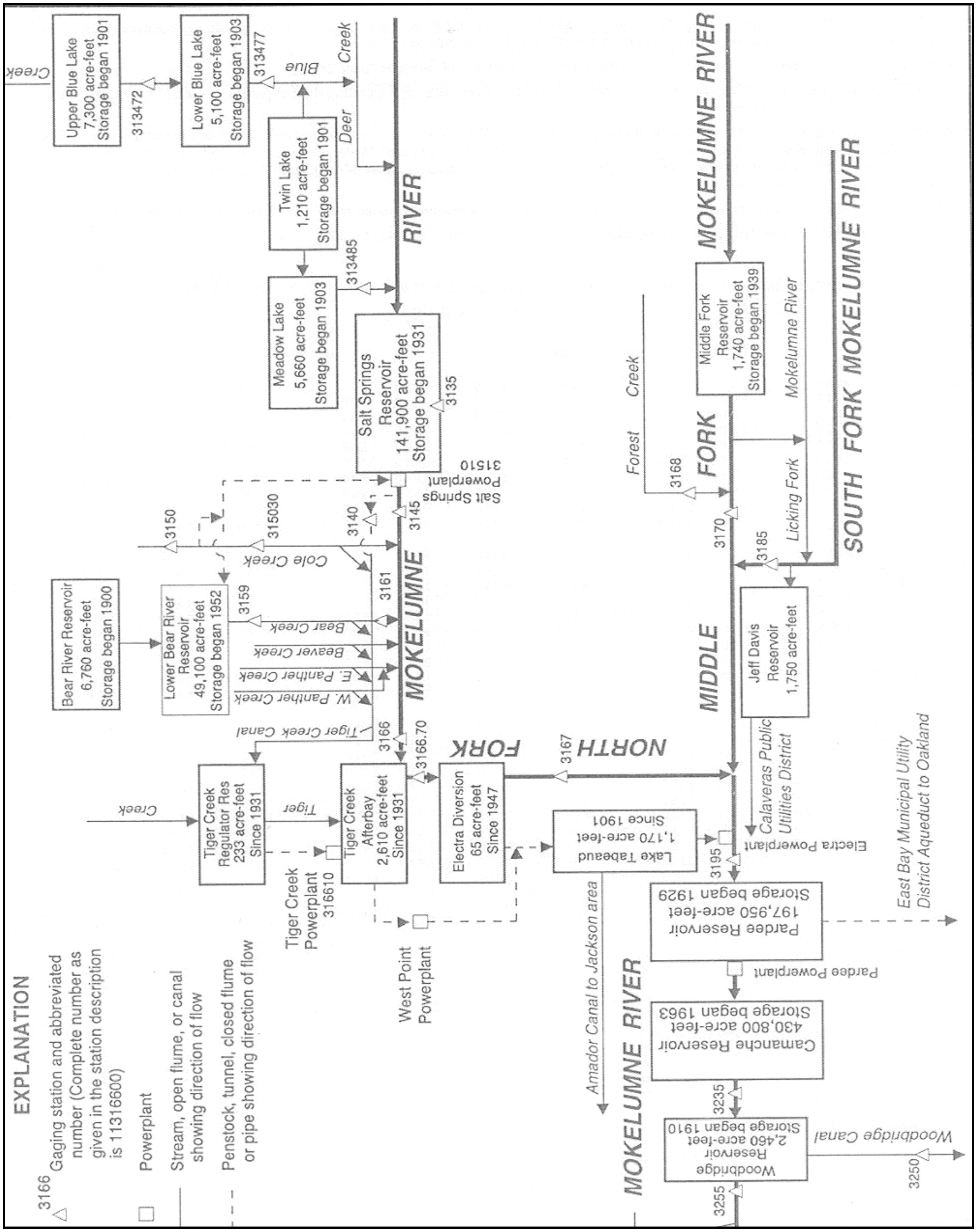


FIGURE 3-5 Mokelumne Flows 2000-2004

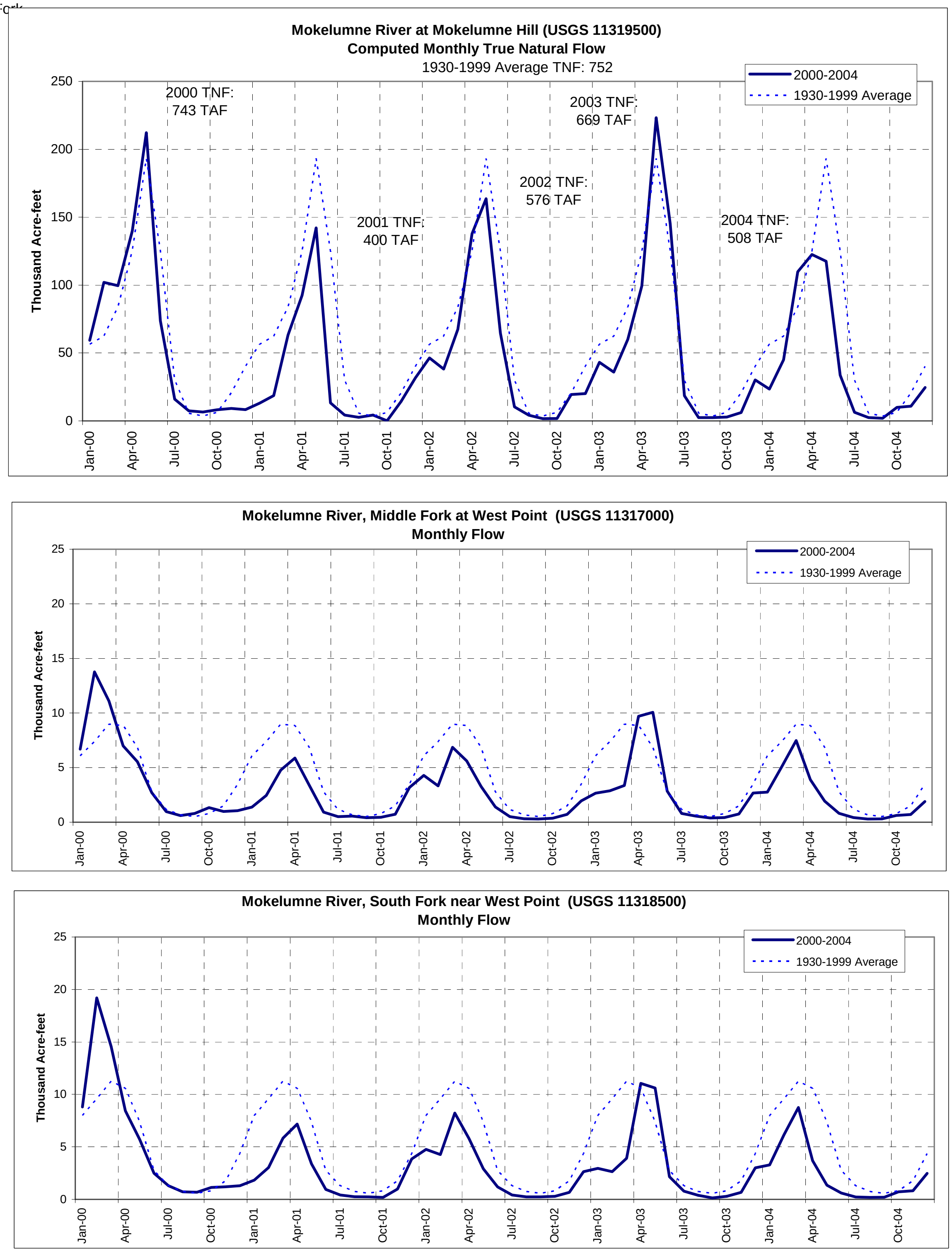
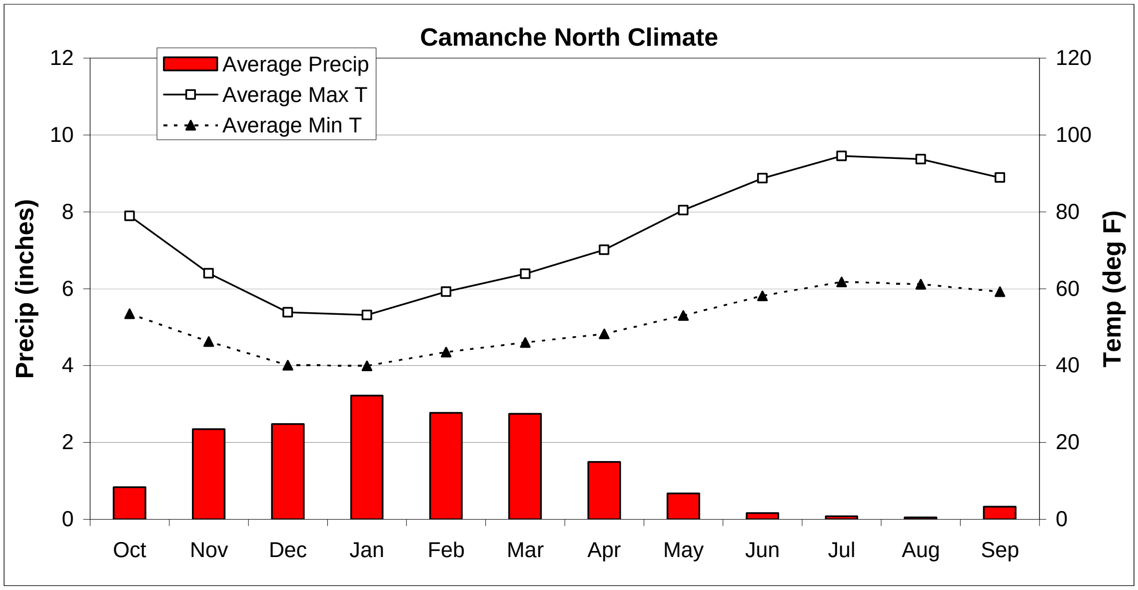


FIGURE 3-6 Camanche Climate



Monthly Avg.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Record
Precipitation	0.8	2.3	2.5	3.2	2.8	2.7	1.5	0.7	0.2	0.1	0.1	0.3	17.19	1966-
Max Temp	79	64	54	53	59	64	70	80	89	95	94	89		1966-
Min Temp	53	46	40	40	43	46	48	53	58	62	61	59		1966-

Table 3-1 Land Use in the Upper Mokelumne River Watershed

LAND USE	ACRES	PERCENT
Open Space[1]	241,350	65.58
Production Forests	121,000	32.88
Residential[2]	2,600	00.71
Large Lot Residential[3]	1,500	00.41
Agriculture[4]	800	00.22
Recreation	400	00.11
Industrial	220	00.03
Commercial	130	00.03
Total	368,000	100.00

NOTES:

1 Open space: Wilderness areas managed upper watershed, grazing land.
2 Residential: Building lots less than 5 acres.
3 Large lot residential: Building lots 5 to 40 acres.
4 Does not include grazing.

Table 3-2: Population Projections by Decade for Each Upper Mokelumne River Watershed County

Table from 2000 MRWSS

County	1980	1990	2000	2010	2020
Alpine	1,100	1,200	1,400	1,700	2,000
Amador	19,300	30,600	42,500	56,100	70,500
Calaveras	21,000	32,500	54,400	78,200	102,200

Current Census data from Ca. Dept of Finance:

	TOTAL POPULATION					
County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
ALPINE	1,247	1,377	1,441	1,413	1,322	1,263
AMADOR	35,434	39,287	42,257	44,404	45,929	47,829
CALAVERAS	40,890	49,599	59,691	70,577	81,886	92,856

CensusTables.xls

Table 3-3: Estimated Populations and Number of Homes
Within the Upper Mokelumne River Watershed

Sub-watershed	Population	Number of Homes
North Fork	1,825	1,320
Middle Fork	1,686	924
South Fork	855	499
Mainstem	1,557	732
TOTAL	5,923	3,475

Table 3-4: Major Landowners in the Upper Mokelumne River Watershed

	BLM	EBMUD	PG&E	SPI	USFS	Other	Total
Main Stem	216	10,399	0	0	55	5,763	16,432
North Fork	3,840	945	5,319	35,706	183,420	19,924	249,154
Middle Fork	1,853	0	0	26,481	8,735	13,109	50,177
South Fork	5,620	0	0	24,037	6,790	14,956	51,403
Total Acres	11,528	11,344	5,319	86,224	198,999	53,751	**367,166** *
% of Total Upper Watershed	3.1%	3.1%	1.4%	23.5%	54.2%	14.6%	100.0%

* compiled from Amador and Calaveras County Parcel data. Gaps in data yield a smaller acreage (less than 1%) than the actual watershed.

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Introduction

This section begins with an updated review of relevant drinking water regulations that apply to the District's system. Monitoring programs are reviewed and documented. Raw water quality data and trends from 2000 to 2004 were evaluated. As part of the evaluation of the District's source water, raw water quality parameters are compared to the drinking water standards. The results of this evaluation indicate the water quality parameters which require removal through treatment. Finally, a general evaluation of seven of the District's water treatment plants (WTPs) was conducted with regards to the Surface Water Treatment Rule (SWTR) and Interim Enhanced Surface Water Treatment Rule (IESWTR) performance standards, monitoring requirements, and operating criteria. Four of the WTPs serve small systems (less than 10,000 people served) and three WTPs serve large systems (greater than 10,000 people served). The four small system WTPs include: Pardee Center, Pardee Recreation, Camanche South Shore, and Camanche North Shore. The three large system WTPs are the Walnut Creek, Lafayette, and Orinda WTPs in the East Bay which treat imported Mokelumne River water from Pardee Reservoir. While the SWTR and IESWTR were written for large systems, each of the seven systems discussed in this report will be evaluated based on the content of these two regulations. In particular, the requirements which address small systems are similar to the IESWTR but developed under the Long Term - Stage 1 ESWTR (LT1ESWTR).

Summary of Drinking Water Regulations

Existing Regulations

The most significant regulations finalized to date as a result of the SDWA, the National Interim Primary Drinking Water Regulations, the 1986 SDWA Amendments, and the 1996 SDWA Amendments are presented in Table 4-1.

Table 4-1: Existing Drinking Water Regulations

Regulation	Targeted Contaminants
Arsenic	Arsenic
Filter Backwash Recycling Rule	Microbes and Turbidity
Lead and Copper Rule	Corrosion By-Products
Information Collection Rule	Microbes and D/DBPs
Interim Enhanced Surface Water Treatment Rule (IESWTR)	Microbes and Turbidity
Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR)	Microbes and Turbidity
Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)	Microbes and Turbidity
Methyl Tertiary-Butyl Ether (MTBE)	MTBE
Phase I, II, and V Regulations	VOCs, SOCs, and IOCs
Public Notification Rule	Contaminants - acute & chronic health effects
Radionuclides	Uranium, Radium 226 & 228, Gross beta, Gross alpha
Stage 1 - Disinfectant/Disinfection By-Product Rule (Stage 1-DBPR)	Disinfectants & Disinfection By-Products
Stage 2 - Disinfectant/Disinfection By-Product Rule (Stage 2-DBPR)	Disinfectants & Disinfection By-Products
Surface Water Treatment Rule (SWTR)	Microbes and Turbidity
Total Coliform Rule (TCR)	Microbes
Trihalomethanes	Trihalomethanes
Unregulated Contaminant Monitoring Rule- List 1 (UCMR 1)	Microbes, IOCs, SOCs, and VOCs

Since the publication of the 2000 Mokelumne River WSS report, several regulations were finalized and added to the list in Table 4-1. These regulations include: Arsenic, Filter Backwash Recycling Rule, Public Notification Rule, Radionuclides, Stage 1 - Disinfectant/Disinfection By-Product Rule (Stage 1 D/DBP Rule) and the IESWTR/LT1EWSTR (for large/small systems, respectively). The LT2ESWTR and Stage 2-DBPR were finally promulgated in January 2006. Brief descriptions of each of these new regulations are provided below.

Arsenic Regulation

The current maximum contaminant level (MCL) for arsenic is 50 µg/L; however, the National Academy of Science (NAS) determined that this concentration does not adequately protect public health. Based on more recently developed scientific information, the USEPA set a finalized MCL was set at 10 µg/L in January 2001 and will be effective on January 23, 2006.

Disinfectant/Disinfection By-Products Rule

Stage 1 and 2 - Disinfectant/Disinfection By-Product Rules

The Stage 1-D/DBP Rule was promulgated in December 1998 and effective as of January 1, 2002 for large systems and January 1, 2004 for small systems. Stage 2-D/DBP Rule was proposed on August 2003 and a final version was promulgated in January 2006. Effective as of January 2012 for large systems and January 2013 for small systems. This regulation changes the Stage 1 MCLs for THMs and HAA5 based on Locational Running Annual Average at each compliance monitoring location instead of the entire system-wide average. Testing for locations with potentially higher HAA5 and THMs will be required as part of the Individual Distribution System Evaluation (IDSE) task. IDSE monitoring is required in 2007. These regulations include MCL and MCL goals (MCLGs) for the following three DBPs and chlorite:

	MCL (mg/L)	MCLG (mg/L)
Total Trihalomethanes (TTHMs)	0.080	
Chloroform		0.07 [1]
Bromodichloromethane		0
Dibromochloromethane		0.06
Bromoform		0
Haloacetic Acids (HAAs)	0.060	
Dichloroacetic acid		0
Monochloroacetic acid		0.070 [1]
Trichloroacetic acid		0.020 [1]
Bromate (an ozonation by-product)	0.010	0
Chlorite	1.0	0.8

Note: 1= Stage 2 DBPR MCLG

Also, maximum residual disinfectant levels (MRDLs) and MRDL goals (MRDLGs) for chlorine, chloramines, and chlorine dioxide were established.

	MRDL (mg/L)	MRDLG (mg/L)
Chlorine as Cl_2	4.0	4.0
Chloramine as Cl_2	4.0	4.0
Chlorine Dioxide as ClO_2	0.8	0.8

In addition, treatment goals for total organic carbon (TOC) removal[1] were also defined in the Stage 1 - D/DBP Rule for all water systems that rely upon surface water or ground water under direct influence (GWUDI) of surface water and implement conventional treatment as shown below. TOC removals, in percent (%) below, must be achieved through either enhanced coagulation or enhanced softening unless the water system meets alternative criteria. Several alternative criteria, not listed here, are in the regulations.

	Source Water Alkalinity (mg/L as $CaCO_3$)		
Source Water TOC (mg/L as C)	0 - 60	> 60 - 120	> 120
> 2.0 to 4.0	35%	25%	15%
> 4.0 to 8.0	45%	35%	25%
> 8.0	50%	40%	30%

Interim Enhanced Surface Water Treatment Rule/Filter Backwash Recycling Rule

The IESWTR was promulgated on December 1998 and effective as of February 1999 for large systems. Under the LT1ESWTR, promulgated on January 2001 for small systems, all utilities are required to provide a 2-log reduction in *Cryptosporidium parvum (Cryptosporidium*). The rules also include a series of more stringent requirements regarding turbidity removal. For these systems, the turbidity of the combined filtered water at each treatment plant must be less than or equal to 0.3 NTU, 95 percent of the time each month. In addition, the combined filtered water turbidity must never exceed 1 NTU. Compliance monitoring for these requirements must be conducted at 4-hour intervals. Individual filter requirements are also stipulated in this regulation to focus attention on problem filters which may allow more turbidity than acceptable for effective particle removal. Also, requirements for microbial disinfection benchmarking or profiling, sanitary surveys, and covering of treated water reservoirs are included in the regulation.

Related to the IESWTR and the LT1ESWTR, the Filter Backwash Recycling Rule was promulgated on June 2001 and pertains to treatment techniques in handling of recycling and backwash solids storage/disposal operations. Approved recycling return locations must be approved and details recorded before such practices can be modified from initial reports made in 2003.

[1] A water treatment plant satisfies the requirements enhanced coagulation if its annual average source water TOC or its annual average treated water TOC is less than 2.0 mg/L.

Long Term 2 Enhanced Surface Water Treatment Rule

While the IESWTR applies to systems serving 10,000 or more people and LT1ESWTR applies to smaller systems, the LT2ESWTR was promulgated in January 2006 for all systems with water treatment technique requirements to mitigate *Cryptosporidium* risks. Under the proposed LT2ESWTR, WTPs would be granted credit toward *Cryptosporidium* removal, depending on the filtration technology currently used.

Plant Type	Log Credit
Conventional treatment (includes softening)	3.0
Direct filtration	2.5
Slow sand or diatomaceous earth filtration	3.0
Alternative filtration technologies	Determined by state through product/site specific testing

Large surface water systems must begin monitoring no later than October 2006 in source waters monthly for *Cryptosporidium*, *E.Coli*, and turbidity for 24 months. Small systems must start sample for *E.Coli* biweekly for one year no later than October 2008. If the mean of *E.Coli* level is greater than 10/100 mL for lakes or reservoirs, or 50/100 mL for flowing streams, then the system samples bimonthly for *Cryptosporidium*. The average *Cryptosporidium* level determines the bin required.

Bin Number	*Cryptosporidium* Concentration (oocysts/L)	Additional Treatment Required[3]
1	<0.075	No additional treatment
2	0.075 to < 1.0	1 log[1] or 1.5 log[2]
3	1.0 to <3.0	2.0 log[1] or 2.5 log[2]
4	>3.0	2.5 log[1] or 3 log[2]

[1]for conventional, softening, slow sand, and diatomaceous earth plants
[2]for direct filtration plants
[3]Additional treatment for alternative filtration technologies will be as determined by the state, so long as the total *Cryptosporidium* removal and inactivation is at least 4.0 logs, 5.0 logs, and 5.5 logs for bins 2, 3 and 4, respectively

On the basis of the highest monthly RAA, or two-year mean if 48 samples are collected, the system will be assigned a bin that will require additional removal requirements for *Cryptosporidium*. Treatment options are specified in "Microbial Toolbox" below.

Microbial Toolbox Option	Proposed *Cryptosporidium* Log Credit with Design Implementation Criteria
Watershed Control Program	0.5 log credit for state-approved program; does not apply to unfiltered systems
Alternative source/intake management	No presumptive credit
Combined filter performance	0.5 log credit in combined effluent turbidity <= 0.15 ntu in 95% of samples in each month
Membranes (microfiltration, ultrafiltration, nanofiltration, and reverse osmosis	Log credit equivalent to removal efficiency demonstrated in challenge test for device or direct integrity testing, whichever is lower.
Ozone	Log credit based on demonstration of log inactivation with contact time table
UV	Log credit based on demonstration of inactivation with UV dose table; reactor testing required to establish validated operating conditions
Individual filter performance	1.0 log credit for demonstration of filtered water turbidity of <0.1 ntu in 95% of daily maximum values from individual filters and no individual filter >0.3 ntu in two consecutive measurements taken 15 minutes apart
Presedimentation basin with coagulation	0.5 log credit with continuous operation and coagulant addition; basins must achieve 0.5 log turbidity reduction
Demonstration of performance	Credit awarded to unit process/treatment train based on demonstration to state

The LT2ESWTR requires compliance with treatment requirements no later than April 2012 of the LT2ESWTR for large systems and October 2014 for small systems. The LT2ESWTR also includes requirements for disinfection profiling and benchmarking of *Giardia* and virus inactivation.

Radionuclides Regulations

The proposed regulations for radionuclides were finalized in September 1999. The radon standard was removed to allow the promulgation of the final regulations. Uranium, Radium 226 and 228, Gross alpha, and Gross beta are the radionuclides included in the final regulation.

Unregulated Compounds

EPA requires utilities to monitor where contaminants for potential regulation need data for its occurrence in water supplies. Round one of unregulated compounds were sampled from 1988 to 1997 and round 2 from 1993 to 1998. Candidate Contaminant Lists (CCLs) were determined from health effects data prior to occurrence data, analytical, treatability, and estimate cost feasibility.

Perchlorate and methyl tertiary butyl ether (MTBE) are both on the first CCL and the past Unregulated Contaminant Monitoring Regulations (UCMR 1). Both of these contaminants are also on the second CCL (CCL 2). The CCL 2 simply comprises the 51 contaminants from the first CCL for which the data were insufficient. Both MTBE and perchlorate will be scrutinized, for their occurrence data from past UCMR 1 monitoring. UCMR 2, proposed in August 2005, includes 26 inorganics and organics, notably perchlorate, RDX, TNT, and various derivatives of Acetochlor, Alachlor, BDE, Metolachlor and NDMA.

Regulations Summary

Table 4-2 presents both USEPA and CDHS standards for the targeted contaminants listed in Table 4-1. For the USEPA drinking water standards, MCLG, MCL, and secondary MCL (SMCL) are shown. Similarly, MCL and SMCL for the California drinking water standards are shown.

The 1986 SDWA Amendments led to the SWTR which includes a recommendation for all surface water systems to develop watershed control plans. As the primacy agency for the implementation of the SWTR, CDHS required the first watershed sanitary survey be conducted by January 1996 for all surface supplies with updates every five years thereafter. The contents of this report constitute the second five-year update.

In the SWTR, USEPA targeted the control of *Giardia lamblia* (*Giardia*), viruses, heterotrophic bacteria, *Legionella*, and turbidity. CDHS determined that all surface waters in California are subjected to potential contamination from *Giardia lamblia* and viruses. There are several species of *Giardia* with *Giardia lamblia* being of most importance from a human health perspective. The SWTR includes the following general requirements in order to minimize human exposure to microbial contaminants in drinking water. The IESWTR added controls of *Cryptosporidium* to the watershed protection requirements.

Utilities are required to achieve at least 99.9 percent (3-log) removal and/or inactivation of *Giardia lamblia* cysts and a minimum 99.99 (4-log) removal and/or inactivation of viruses.

Utilities are required to achieve at least 99 percent (2-log) removal and/or inactivation of *Cryptosporidium*. These removals may include a combination of minimum disinfectant residual for the minimum contact time and given log removals for the treatment process used, usually coagulation, sedimentation, and filtration.

The disinfectant residual entering the distribution system must not fall below 0.2 mg/L for more than 4 hours during any 24-hour period.

A disinfectant residual must be detectable in 95 percent of distribution system samples. The presence of heterotrophic plate count bacteria at concentrations less than or equal to 500 colony forming units per milliliter is considered equivalent to a detectable disinfectant residual.

Removal and/or inactivation credits are contingent upon complying with turbidity treatment techniques for proven particle removal practice for operating filter systems.

Table 4-2: Drinking Water Standards

			USEPA			California CDHS(2)	
Water Quality Parameters	Regulation	Best Available Technology (1)	MCLG mg/L	MCL mg/L	SMCL mg/L	MCL mg/L	SMCL mg/L
GENERAL PHYSICAL							
Color (units)					15		15
Odor Threshold (TON)					3		3
Specific conductance							900
Total dissolved solids					500		500
Turbidity (NTU)	IESWTR	C-F, SSF, DEF, DF, D		0.3		0.3	
pH					6.5-8.5		6.5-8.5
Corrosivity					non-corrosive		non-corrosive
Foaming Agents (MBAS)					0.5		0.5
MICROBIOLOGICAL							
Cryptosporidium	IESWTR	C-F, SSF, DEF, DF, D	0	TT			
E. coli	TCR	D	0	(4)		(4)	
Fecal coliforms	TCR	D	0	(4)		(4)	
Giardia lamblia	SWTR	C-F, SSF, DEF, DF, D	0	TT		TT	
Heterotrophic bacteria(3)	SWTR	C-F, SSF, DEF, DF, D		TT		TT	
Legionella (3)	SWTR	C-F, SSF, DEF, DF, D	0	TT		TT	
Total Coliform	TCR	D	0	(5)		(5)	

			USEPA			California CDHS(2)	
Water Quality Parameters	Regulation	Best Available Technology (1)	MCLG mg/L	MCL mg/L	SMCL mg/L	MCL mg/L	SMCL mg/L
Viruses (3)	SWTR	C-F, SSF, DEF, DF, D	0	TT		TT	
RADIONUCLIDES							
Beta particle and photon emitters (mrem)	Interim Radionuclides	C-F, IX, RO	0	4		4 (50 pCi/L)	
Gross Alpha (pCi/L)	Interim Radionuclides	C-F, RO	0	15		15	
Radium-226 + Radium 228 (pCi/L)	Interim Radionuclides		0	5		5	
Radium-226 (pCi/L)	Radionuclides	LS, (2) IX, RO					
Radium-228 (pCi/L)	Radionuclides	LS, (2) IX, RO					
Radon (pCi/L)	Radionuclides	AR					
Tritium (pCi/L)	Radionuclides					20,000	
Strontium-90 (pCi/L)	Radionuclides					8	
Uranium (pCi/L)	Radionuclides	C-F, (2) LS, (2) AX	0	30		20	
INORGANIC CHEMICALS							
Aluminum					0.05-0.2	1	0.2
Antimony	Phase V	C-F(2) RO	0.006	0.006		0.006	
Arsenic	Interim Arsenic	NA	0	0.05		0.05	
Asbestos > 10µm (MFL)	Phase ll	C-F(2), DF, DEF, CC	7	7		7	
Barium	Phase ll	IX, RO, LS(2)	2	2		1	
Beryllium	Phase V	IX, RO, C-F(2), LS(2), AA, IX	0.004	0.004		0.004	
Bromate	Stage 1 D/DBP	DC	0	0.01			
Cadmium	Phase ll	C-F(2),LS (2), IX, RO	0.005	0.005		0.005	
Chloride	Phase 1				250		250
Chlorite	D/DBP	DC	0.8	1			
Chromium (total)	Phase II	C-F(2), LS, (Cr lll)(2), IX, RO	0.1	0.1		0.05	

			USEPA			California CDHS(2)	
Water Quality Parameters	Regulation	Best Available Technology (1)	MCLG mg/L	MCL mg/L	SMCL mg/L	MCL mg/L	SMCL mg/L
Copper	LCR	CC, SWT	1.3	TT			1
Cyanide	Phase V	IX, RO, C12	0.2	0.2		0.15	
Fluoride	Fluoride	AA, RO	4	4	2	2.0	
Iron					0.3		0.3
Lead	LCR	CC, PE, SWT, LSLR	0	TT			
Manganese					0.05		0.05
Mercury	Phase II	C-F (influent ≤ 10µg/L)	0.002	0.002		0.002	
		(2)LS, (2)GAC, RO					
Nickel	Phase V	LS, (2) IX, RO				0.1	
Nitrate (as N)	Phase ll	IX, RO, ED	10	10		40 (as NO3)	
Nitrite (as N)	Phase ll	IX, RO		1		1	
Nitrate + nitrite (both as N)	Phase ll	IX, RO				10	
Selenium	Phase ll	C-F (Se IV) (2), LS(2),	0.05	0.05		0.05	
		AA, RO, ED					
Silver					0.1		0.1
Sulfate	Sulfate	RO, IX, ED	500	500	250		250-500
Thallium	Phase V	IX,AA	0.0005	0.002		0.002	
Zinc					5		5
ORGANIC CHEMICALS							
Acrylamide	Phase II	PAP	0	TT			
Alachlor	Phase II	GAC	0	0.002		0.002	
Aldicarb	Phase II	GAC					
Aldicarb sulfone	Phase II	GAC	0.001	0.002			
Aldicarb sulfoxide	Phase II	GAC	0.001	0.004			
Atrazine	Phase II	GAC	0.003	0.003		0.001	
Bentazon						0.018	
Benzene	Phase I	GAC, PTA	0	0.005		0.001	
Benzo(a)pyrene	Phase V	GAC	0	0.0002		0.0002	
Bromodichloro-methane	Stage 1 & 2 D/DBP	EC	0	NA			
Bromoform	Stage 1 & 2 D/DBP	EC	0	NA			

			USEPA			California CDHS(2)	
Water Quality Parameters	Regulation	Best Available Technology (1)	MCLG mg/L	MCL mg/L	SMCL mg/L	MCL mg/L	SMCL mg/L
Carbofuran	Phase II	GAC	0.04	0.04		0.018	
Carbon tetrachloride	Phase I	GAC, PTA	0	0.005		0.0005	
Chlordane	Phase II	GAC	0	0.002		0.0001	
Chloroform	Stage 2 D/DBP	EC	0.07	NA			
2,4-D	Phase II	GAC	0.07	0.07		0.07	
Dalapon	Phase V	GAC	0.2	0.2		0.2	
Di(2-ethylhexyl) adipate	Phase V	GAC, PTA	0.4	0.4		0.4	
Di(2-ethylhexyl) phthalate	Phase V	GAC	0	0.006		0.004	
Dibromochloro-methane	Stage 1 & 2 D/DBP	EC	0.06	NA			
Dibromochloro-propane (DBCP)	Phase II	GAC, PTA	0	0.0002		0.0002	
Dichloroacetic acid	Stage 1 & 2 D/DBP	EC	0	NA			
p-Dichlorobenzene	Phase I	GAC, PTA	0.075	0.075		0.005	
o-Dichlorobenzene	Phase II	GAC, PTA	0.6	0.6		0.6	
1,1-Dichloroethane		GAC, PTA				0.005	
1,2-Dichloroethane	Phase I	GAC, PTA	0	0.005		0.0005	
1,1-Dichloroethylene	Phase I	GAC, PTA	0.007	0.007		0.006	
1,3 – Dichloropropene						0.0005	
cis-1,2-Dichloroethylene	Phase II	GAC, PTA	0.07	0.07		0.006	
trans-1, 2-Dichloroethylene	Phase II	GAC, PTA	0.1	0.1		0.01	
Dichloromethane (methylene chloride)	Phase V	PTA	0	0.005		0.005	
1, 2-Dichloropropane	Phase II	GAC, PTA	0	0.005		0.005	
Dinoseb	Phase V	GAC	0.007	0.007		0.007	
Diquat	Phase V	GAC	0.02	0.02		0.02	
Endothall	Phase V	GAC	0.1	0.1		0.1	
Endrin	Phase V	GAC	0.002	0.002		0.002	
Epichlorohydrin	Phase II	PAP	0	TT			
Ethylbenzene	Phase II	GAC, PTA	0.7	0.7		0.7	
Ethylene dibromide (EDB)	Phase II	GAC, PTA	0	0.00005		0.00005	
Glyphosate	Phase V	OX	0.7	0.7		0.7	

			USEPA			California CDHS(2)	
Water Quality Parameters	Regulation	Best Available Technology (1)	MCLG mg/L	MCL mg/L	SMCL mg/L	MCL mg/L	SMCL mg/L
Haloacetic acids (sum of 5; HAA)	Stage 1 & 2 D/DBP	EC		0.06			
Heptachlor	Phase II	GAC	0	0.0004		0.00001	
Heptachlor epoxide	Phase II	GAC	0	0.0002		0.00001	
Hexachlorobenzene	Phase V	GAC	0	0.001		0.001	
Hexachlorocyclopentadiene	Phase V	GAC, PTA	0.05	0.05		0.05	
Lindane	Phase II	GAC	0.0002	0.0002		0.0002	
Methoxychlor	Phase II	GAC	0.04	0.04		0.03	
Methyl Tertiary-Butyl Ether	MTBE					0.005	0.013
Molinate						0.02	
Monochlorobenzene	Phase II	GAC, PTA	0.1	0.1		0.07	
Oxamyl (vydate)	Phase V	GAC	0.2	0.2		0.05	
Pentachlorophenol	Phase II	GAC	0	0.001		0.001	
Picloram	Phase V	GAC	0.5	0.5		0.5	
Polychlorinated byphenyls (PCBs)	Phase II	GAC	0	0.0005		0.0005	
Simazine	Phase V	GAC	0.004	0.004		0.004	
Styrene	Phase II	GAC, PTA	0.1	0.1		0.1	
2,3,7,8 TCDD (dioxin)	Phase V	GAC	0	3 x E -8		3 x E -8	
1,1,2,2-Tetrachloro-ethane		GAC				0.001	
Tetrachloroethylene	Phase II	GAC, PTA	0	0.005		0.005	
Thiobencarb		GAC, PTA				0.07	0.001
Toluene	Phase II	GAC, PTA	1	1		0.15	
Toxaphene	Phase II	GAC	0	0.003		0.003	
2,4,5 TP (silvex)	Phase II	GAC	0.05	0.05		0.05	
Trichloroacetic acid	Stage 1 & 2 D/DBP	EC	0.3	NA			
1,2,4-Trichlorobenzene	Phase V	GAC, PTA	0.07	0.07		0.005	
1,1,1-Trichloroethane	Phase I	GAC, PTA	0.2	0.2		0.2	
1,1,2-Trichloroethane	Phase V	GAC, PTA	0.003	0.005		0.005	
Trichloroethylene	Phase I	GAC, PTA	0	0.005		0.005	
Trichlorofluoromethane		GAC, PTA				0.15	
1,1,2-Trichloro-1,2,2-Trifluoroethane		GAC, PTA				1.2	

			USEPA			California CDHS(2)	
Water Quality Parameters	Regulation	Best Available Technology (1)	MCLG mg/L	MCL mg/L	SMCL mg/L	MCL mg/L	SMCL mg/L
Trihalomethanes (sum of 4; THMs)	Stage 1 & 2 D/DBP	AD, PR, SPC, EC	NA	0.080		0.080	
Vinyl chloride	Phase I	PTA	0	0.002		0.0005	
Xylenes (total)	Phase II	GAC + PTA	10	10		1.75	

NOTES: (1) *AA-activated alumina, AD—altemative disinfectants, AR—aeration, AX—anion exchange. CC—corrosion control, C-F—coagulation and filtration, Cl2—chlorination, D—disinfection. DC—disinfection system control, DEF—diatomaceous earth filtration, DF direct filtration, EC—enhanced coagulation, ED electrodialysis, GAC— granular activated carbon, IX—ion exchange, LS—lime softening, LSLR—lead service line replacement, NA—not applicable, OX — oxidation, PAP — polymer addition practices, PE—public education, PR—precursor removal, PS—performance standard, PTA—packed tower aeration, RO—reverse osmosis, SPC—stop pre-chlorination, SSF—slow sand filtration, SWT—source water treatment, TT—treatment technique.

(2) California MCL and SMCL from California Code of Regulations Title 22, Update January, 1995

(3) Coagulation-filtration and lime softening are not BAT for small systems for variances unless treatment is already installed.

(4) Final for systems using surface water, also being considered for groundwater systems

(5) lf a repeat total coliform sample is fecal coliform- or *E. coli*-positive. The system is also in violation of the MCL for total coliforms if a routine sample is a fecal coliform- or E. coli-positive and is followed by a total coliform-positive repeat sample.

(6) No more than 5 percent of the samples per month may be positive. For systems collecting fewer than 40 samples per month, no more than 1 sample per month may be positive.

Anticipated Regulations

As a result of the regulatory activities initiated by the 1996 SDWA Amendments, a number of regulations have been redefined and/or rescheduled for development and promulgation. With an emphasis on strengthening the scientific basis or risk assessment information and approach being used to establish MCLs additional time is required for development and promulgation. In addition, the emphasis on ensuring that the benefits gained from a public health perspective outweigh or balance the costs of treatment is resulting in a more thorough public comment period. Below are the more pertinent regulations which are scheduled for promulgation are reflected in Table 4-3.

Table 4-3: Status of Anticipated Drinking Water Regulations (1)

Anticipated Regulation	Targeted Contaminants	Status
Drinking Water Candidate Contaminants List 2	VOCs, SOCs, IOCs, Microbes	Proposed 2/05
Ground Water Rule	Viruses	Proposed 3/00 Final 2/06(?)
Radon	Radon	Proposed 11/99
Sulfate	Sulfate	DWCCL 2001 Proposed 8/03 Removed from CCL
UCMR 2	SOCs and IOCs	Proposed 8/05

(1) Anticipated Drinking Water Regulations as of January 2006.

Ground Water Rule

The former Ground Water Disinfection Rule (GWDR) was restructured and named the Ground Water Rule (GWR). A proposed version has been available since March 2000. The final rule has been delayed since 2001. The GWR establishes multiple barriers to protect public health against bacteria and viruses. A targeted strategy is included to identify those systems which are at high risk for fecal contamination. A 4-log (99.99 %) removal of viruses, sanitary surveys to identify system deficiencies, source water monitoring for undisinfected systems and compliance monitoring for disinfected systems are all delineated in the proposed rule.

Drinking Water Candidate Contaminant Lists (DWCCL)

A draft candidate contaminant list (CCL) was published in 1997 and a final list (CCL 1) was published in March 1998. The CCL 1 list contained 50 chemical and 10 microbiological contaminants being considered for future regulation. Since then, another list, CCL 2, was finalized in February 2005 with 42 chemical and 9 microbiological contaminants. Some parameters not carried over from the CCL 1 were: Aldrin, Dieldrin, Manganese, Sodium, Sulfate and Naphthalene.

Sulfate Regulations

The proposed MCL of 500 mg/L for the control of sulfate in drinking water supplies was published in December 1994. Because sulfate is considered a low public health priority, further development of this regulation was postponed. Sulfate was selected for regulation by August 2001 under the DWCCL program, but was determined that it would not present a meaningful opportunity for health risk reduction. Mild health effects generally occur at levels greater than SMCL of 500 mg/L.

Radon Regulation

The radon regulation was separated from the remaining radionuclides given that radon in air, and not water, is the key public health concern. A proposed regulation was published in November 1999. This regulation addresses communities which serve greater than 25 people and use ground water or mixed ground water and surface water sources. If the source water radon concentration is less than 300 pCi/L, the water does not need to be treated.

Summary of Available Raw Water Quality Data

The District conducts several water quality monitoring programs on Pardee and Camanche Reservoirs for regulatory compliance, water rights, environmental assessment, and water supply objectives. In addition, EBMUD monitors general water quality parameters throughout the reservoirs to assist staff in managing reservoir operations and water treatment issues. Descriptions of the monitoring programs that pertain to the raw water quality of Pardee and Camanche Reservoirs are presented in the following sections.

Water Quality Data

EBMUD monitors reservoir water quality conditions on a weekly basis at several locations throughout Pardee and Camanche Reservoirs (Figure 4-1). The water quality parameters – temperature, pH, dissolved oxygen, specific conductance, and oxidation reduction potential – are profiled by depth. Field conditions and turbidity measurements are recorded as well. This information is analyzed and reviewed on a routine basis to assist the District's water supply operations

Title 22 Monitoring Program

Appendix B contain the District's Title 22 monitoring schedule for Pardee Recreation Area, Pardee Center, Camanche North Shore Recreation Area, and Camanche South Shore Recreation Area.

Title 22 from the California Code of Regulations is a compilation of rules and regulations that addresses human health and safety issues. The Environmental Health section includes drinking water standards, reclamation criteria, and hazardous waste. The Domestic Water Quality and Monitoring chapter (which deals with drinking water standards and monitoring requirements) and the Surface Water Filtration and Disinfection Treatment chapter have the most relevance to watershed sanitary survey requirements.

The water quality constituents for Title 22 compliance are addressed by category – volatile organics chemicals; synthetic organic chemicals; fluoride, asbestos; nitrates and nitrites; inorganic chemicals; general mineral and general physical; and radiological. In September 1993, CDHS granted the District's request for a reduced monitoring program for certain parameters. Since the 1995 MRWSS, the District has revised the Title 22 Raw Water Monitoring Program to reflect the changes from the Title 22 Emergency rulemaking of September 1994.

In accordance with Title 22 requirements, the District prepares a Consumer Confidence Report that summarizes the water quality conditions being supplied to District consumers. Appendix B contains the Consumer Confidence Reports for 2000-2004 for the District's Pardee Recreation Area, Pardee Center, Camanche North Shore, and Camanche South Shore water supply systems.

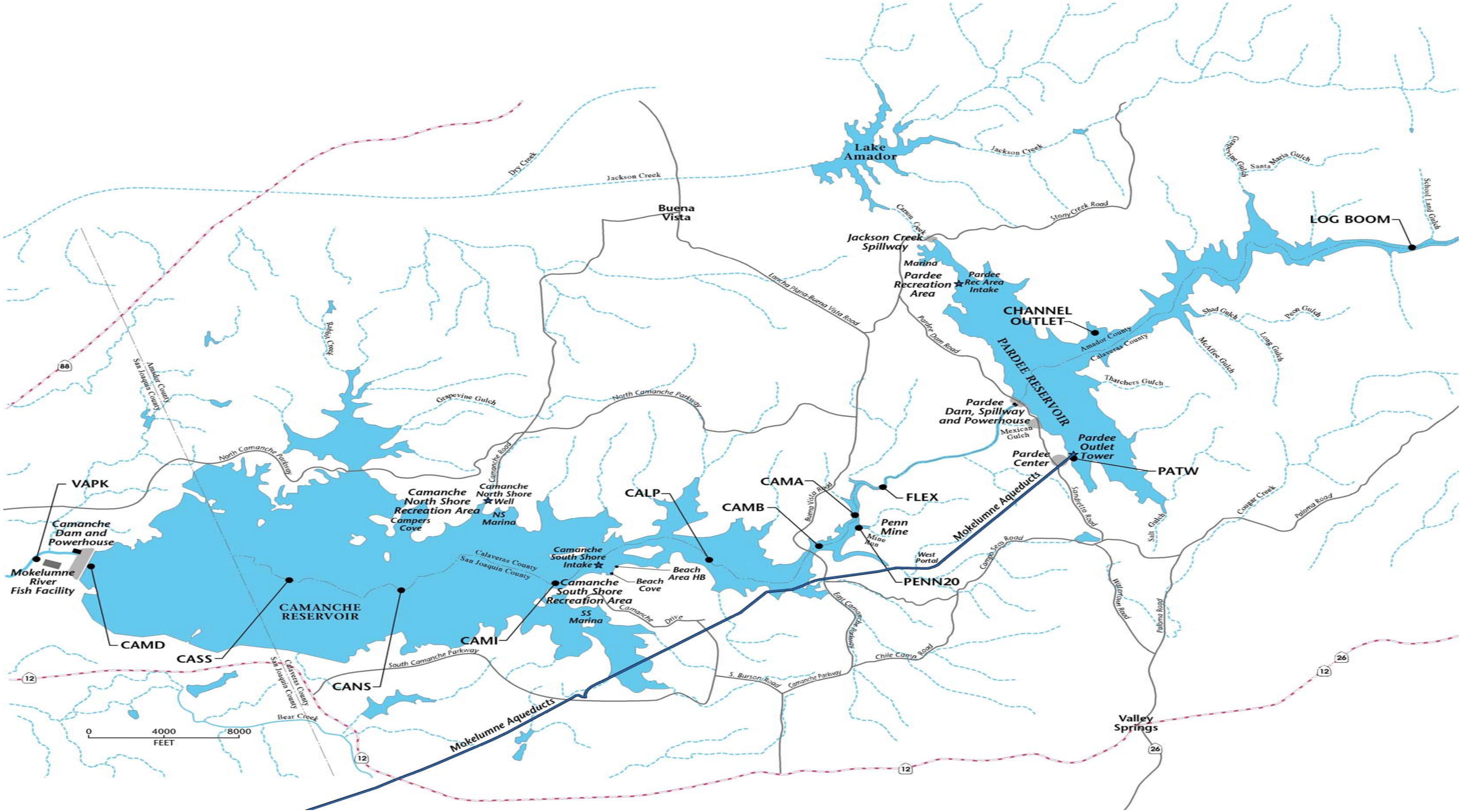
Mokelumne River and Tributary Monitoring

The District monitors water quality on a monthly basis at eight locations along the Mokelumne River and its main tributaries upstream of Pardee Reservoir (Table 4-4). The purpose of this monitoring program is to develop a long-term record of water quality conditions to establish a baseline and to monitor long-term trends. The monthly grab samples are analyzed for total coliform, fecal coliform, *E.Coli*, and turbidity. A flow estimate is recorded as well. Figure 4-2 depicts the locations of these sampling sites in the Upper Mokelumne Watershed. However, in the past five years, only the data from MRHW49 were analyzed within sample hold time.

Table 4-4: Mokelumne River and Tributary Monitoring Stations

Station	Description
MRHW49	Mokelumne River at Highway 49 crossing
MRPH	Mokelumne River approx. half mile downstream of Electra Powerhouse at PG&E day-use recreation area
MRWG	Wilson Gulch approx. quarter mile downstream of Highway 49 crossing
MRHW26	South Fork Mokelumne River at Highway 26 crossing
MRLF	South Fork Mokelumne River at Railroad Flat Road crossing, approx. quarter mile upstream of Licking Fork confluence
MRPW	Middle Fork Mokelumne River upstream of Wilseyville (CCWD) pump station, approx. 1 mile upstream of Highway 26 crossing
MRWP	Middle Fork Mokelumne River at West Point (Highway 26 crossing)
MRTC	North Fork Mokelumne River below Tiger Creek Powerhouse afterbay.

FIGURE 4-1 - EBMUD Water Quality Monitoring Stations



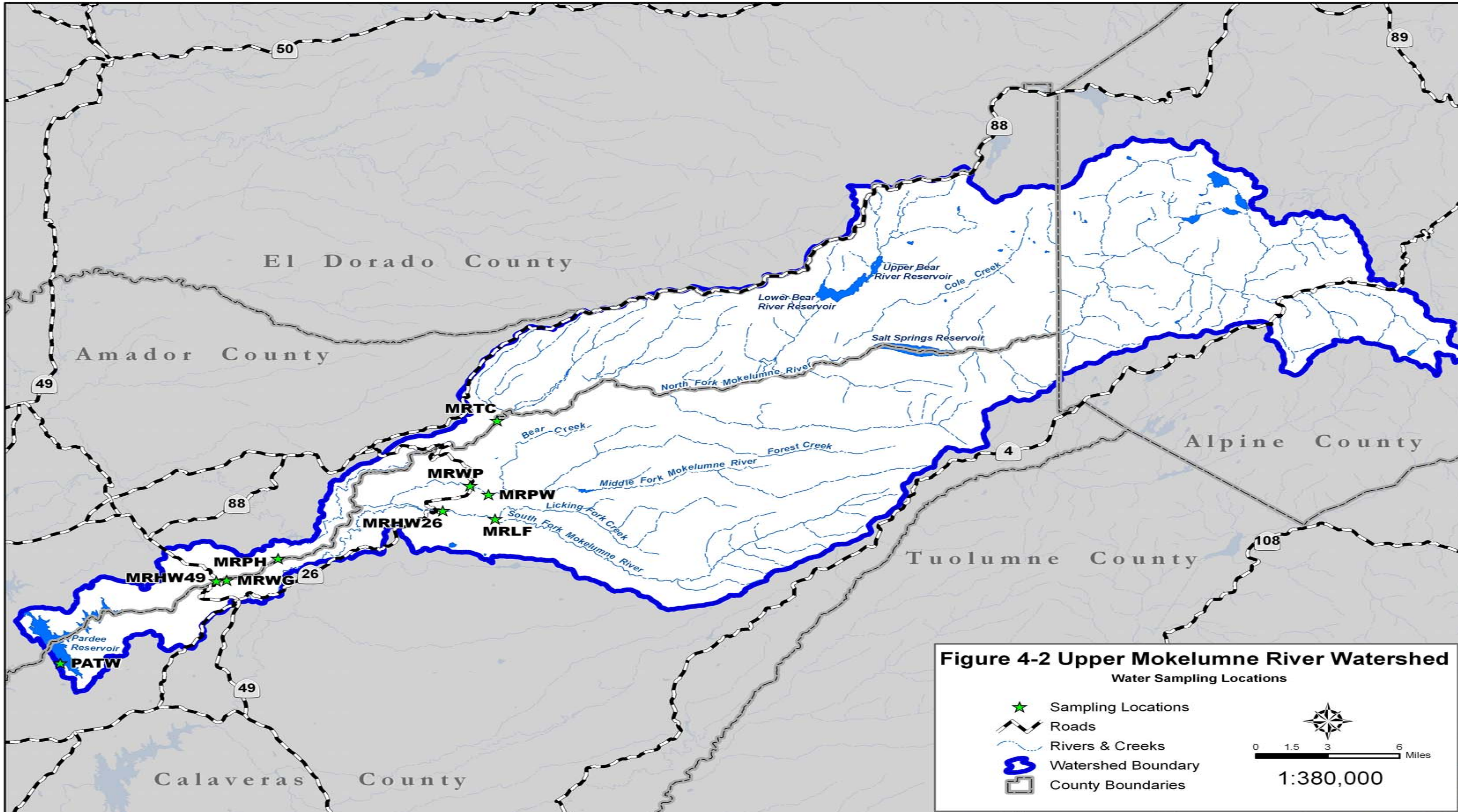


Figure 4-2 Upper Mokelumne River Watershed
Water Sampling Locations
Sampling Locations
Roads
Rivers & Creeks
Watershed Boundary
County Boundaries
0 1.5 3 6 Miles
1:380,000
El Dorado County
Amador County
Alpine County
Tuolumne County
Calaveras County
50
88
89
49
4
26
108
Upper Bear River Reservoir
Lower Bear River Reservoir
Cole Creek
Salt Springs Reservoir
North Fork Mokelumne River
Bear Creek
Forest Creek
Middle Fork Mokelumne River
Licking Fork Creek
South Fork Mokelumne River
Pardee Reservoir
MRTC
MRWP
MRPW
MRHW26
MRLF
MRPH
MRHW49
MRWG
PATW

Giardia Monitoring

Sampling for *Giardia* was initiated in 1991 at the influent tap of the Walnut Creek WTP to determine whether *Giardia* was present in water delivered from Pardee Reservoir. This sampling continued on a monthly basis from March to August 1991. Beginning in November 1994, the District initiated a sampling program for *Giardia* at Pardee Reservoir and the Walnut Creek WTP influent two to three times monthly. From mid-1995 through 1998, *Giardia* sampling occurred on a monthly basis. In 1999, based on consistent low levels of *Giardia*, this sampling was reduced to semi-annual collection.

Cryptosporidium Monitoring

Cryptosporidium samples were collected from the Walnut Creek WTP influent tap from March to August 1991 to monitor for the presence of *Cryptosporidium* in the water delivered from Pardee Reservoir. The results of this sampling indicated that *Cryptosporidium* was present in the water. Additionally, a sampling program was initiated for *Cryptosporidium* and enteric viruses in September 1994 in anticipation of the ICR. The results were documented in the 1995 MRWSS. *Cryptosporidium* has been sampled on a monthly basis from 1995 through 1998. In 1999, the frequency of sampling was reduced to semi-annual collection, based on consistent low levels at or near the detection limit.

Special Studies

A number of special studies are conducted on the raw and treated waters corresponding to the Upper Mokelumne River Watershed. An overview of these special studies are provided below.

Penn Mine

Penn Mine is an abandoned copper/zinc mine located adjacent to the District's Camanche Watershed property, along its upper reaches. The mine was opened in 1861, and periods of major mining activity occurred from 1899 through 1919 and during World War II. Heavy metals in stormwater runoff from the mine were linked to fish losses. Even after the mine was closed in the 1950s, problems persisted. Although the mine was not on District property, the District has worked for many years with the Regional Water Quality Control Board (RWQCB) to resolve the pollution problems and protect Camanche Reservoir and the Lower Mokelumne River. In February 1993, the District and RWQCB built an in-line treatment system to treat the acid rock drainage and avoid untreated discharges during high storm events over the spillway of Mine Run Dam. The USEPA approved these efforts and continues to provide regulatory oversight on water quality compliance. In February 1997, the District and the RWQCB – Central Valley Region, completed environmental documentation that identified a long-term solution to the acid rock drainage from the Penn Mine site. The solution included construction of a landfill onsite, excavation of mine waste and placement of the waste in the landfill, and the restoration and revegetation of the Penn Mine site. The Penn Mine Environmental Restoration Project was initiated in summer 1997 and completed in November 1999. Water quality monitoring was conducted throughout the restoration project. Post-restoration monitoring is ongoing. Receiving water samples are collected in Camanche Reservoir at designated locations.

Methyl Tertiary-Butyl Ether

Methyl tertiary-butyl ether (MTBE) is a SOC used in the blending of gasoline to boost octane and reduce emissions of air pollutants from automobile engines. Since the early 1990's until December 2002, MTBE was used in gasoline to meet federal Clean Air Act requirements. The proactive District began using MTBE-free fuel at Pardee Recreation Area for boating purposes in 1999. Since the introduction of MTBE-enhanced gasoline, MTBE has been detected in both surface and ground water supplies. For surface water sources such as reservoirs, this contamination has been linked to the use of motorized watercraft. Motorized watercrafts are permitted for recreational purposes on Pardee and Camanche Reservoirs.

Potential health concerns upon MTBE detection in surface waters became a primary concern in the drinking water industry the mid-1990s. The District began monitoring for MTBE on a monthly basis at Pardee and Camanche Reservoirs in 1995. Subsequent monitoring at both Pardee and Camanche Reservoirs detected MTBE. MTBE was not detected in any of the District's reservoirs (in the East Bay) where recreational motorized boating is prohibited. By early 1998, the District had developed an Action Plan that was intended to reduce or eliminate MTBE contamination in its drinking water reservoirs. The District's plan focused on source prevention: expanded monitoring, restriction of high emission outboard engines, and public outreach.

MTBE concentrations occurred prior to the MTBE statewide phase-out in Pardee and Camanche Reservoirs beginning in April and continuing through September as a consequence of increased motorized boating. These concentrations were at their maximum levels during the major holidays - Memorial Day, Fourth of July and Labor Day. MTBE concentrations then diminished to non-detect levels during November through January when motorized boating ceased at these reservoirs. In 1998, all District-owned and concessionaire-owned 2-stroke high emission engines were replaced with 4-stroke low emission engines. Following actions, average reservoir MTBE levels decreased slightly as later discussed.

Mokelumne River Watershed Area - Water Quality Conditions

This section summarizes water quality in the Upper Mokelumne River Watershed area -- Mokelumne River, Pardee Reservoir, and Camanche Reservoir. Raw and treated water quality monitoring data are compared with corresponding drinking water quality regulatory standards, described previously in the Summary of Drinking Water Regulations. Sources for the raw water quality data are listed in the section entitled Summary of Available Raw Water Quality Data.

Mokelumne River and Tributary Monitoring – Evaluation of Water Quality

The District monitors water quality on a monthly basis along the Mokelumne River at Highway 49 crossing approximately two miles upstream of Pardee Reservoir (refer to Figure 4-2). The purpose of this monitoring program is to develop a long-term record of water quality conditions (total coliform, fecal coliform, *E.Coli*, *Giardia*, *Cryptosporidium*, TOC, metals, nutrients, planktons, TSS, herbicides/pesticides and turbidity) to establish a baseline and monitor long-term trends.

Figures 4-3 through 4-8 depict the seasonal fluctuations in bacteriological data, TOC, and turbidity from January 2000 through December 2004 for the Mokelumne River Highway 49 Monitoring station. The District also monitors water quality at other locations throughout the watershed as listed in table 4-8; however a majority of the bacteriological data at those locations were not analyzed within hold time, and therefore not reported in this section. Total and fecal coliform, *E.Coli*, and turbidity data sampled at north, middle, and south forks of the Mokelumne River can be found in Appendix G, where valid data are within the range observed in the previous update.

Figure 4-3: Mokelumne River Sampling (Highway 49) -- Turbidity

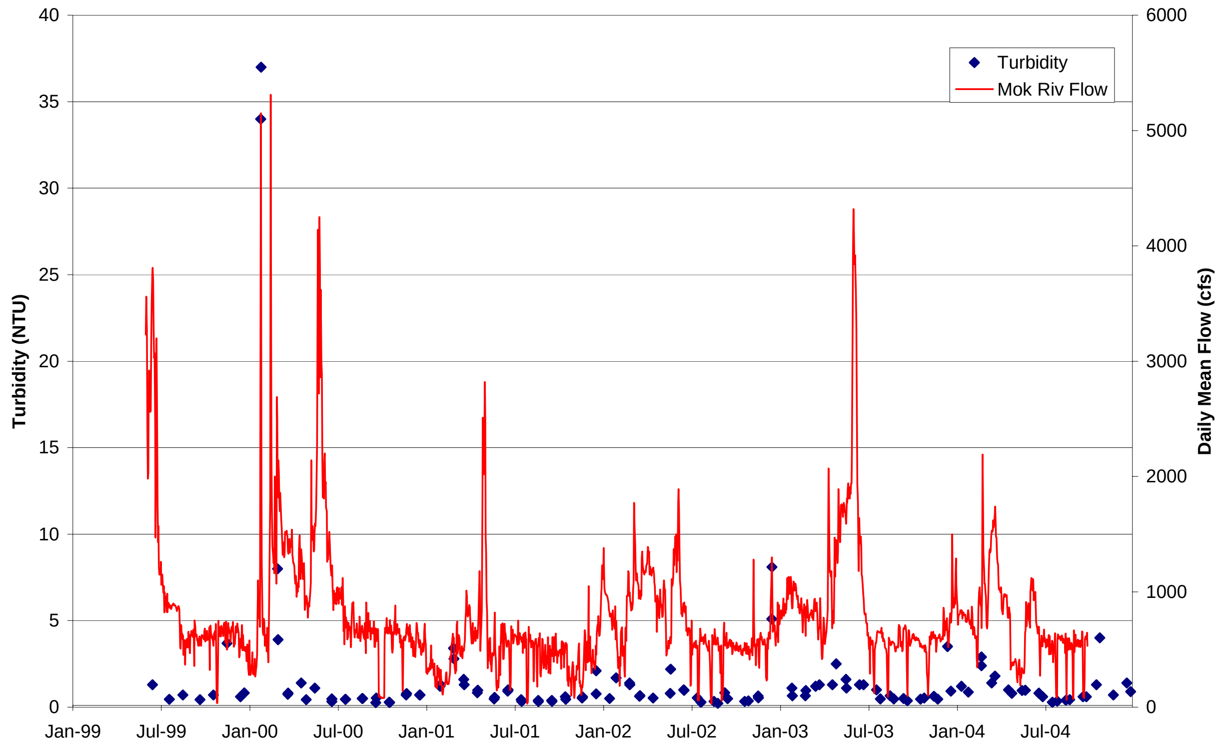


Figure 4-4: Mokelumne River Sampling (Highway 49) -- TOC

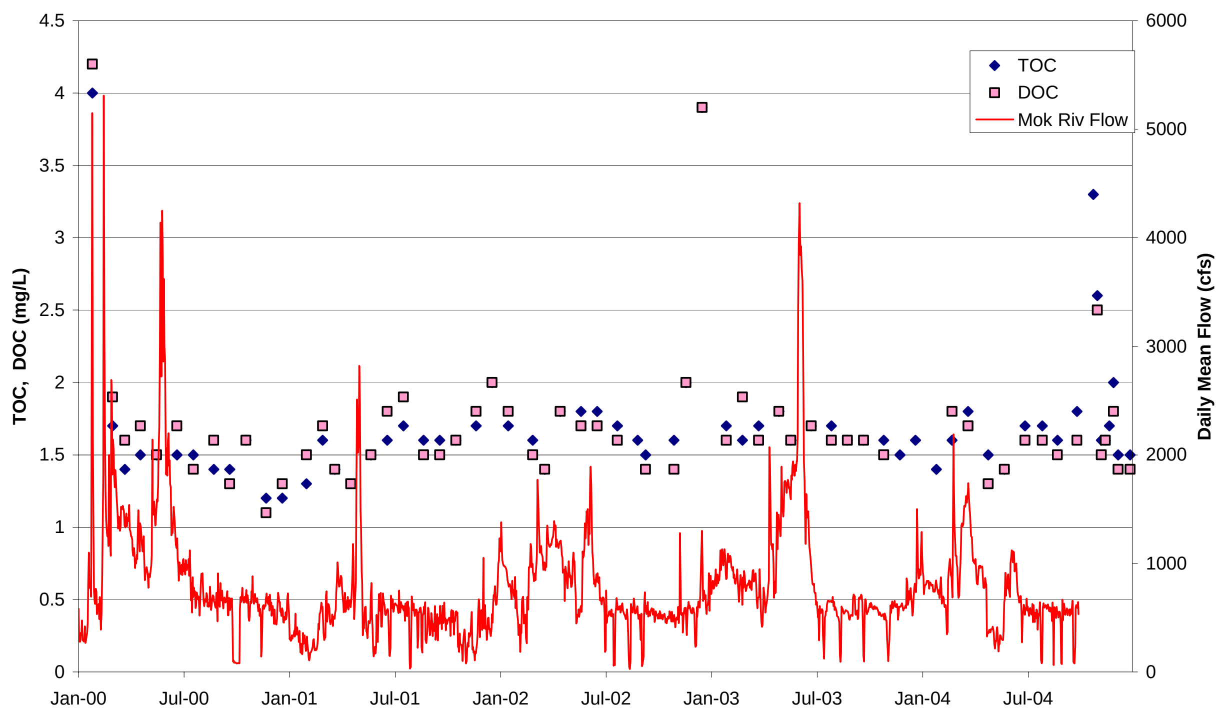


Figure 4-5: Mokelumne River Sampling (Highway 49) -- Total Coliform

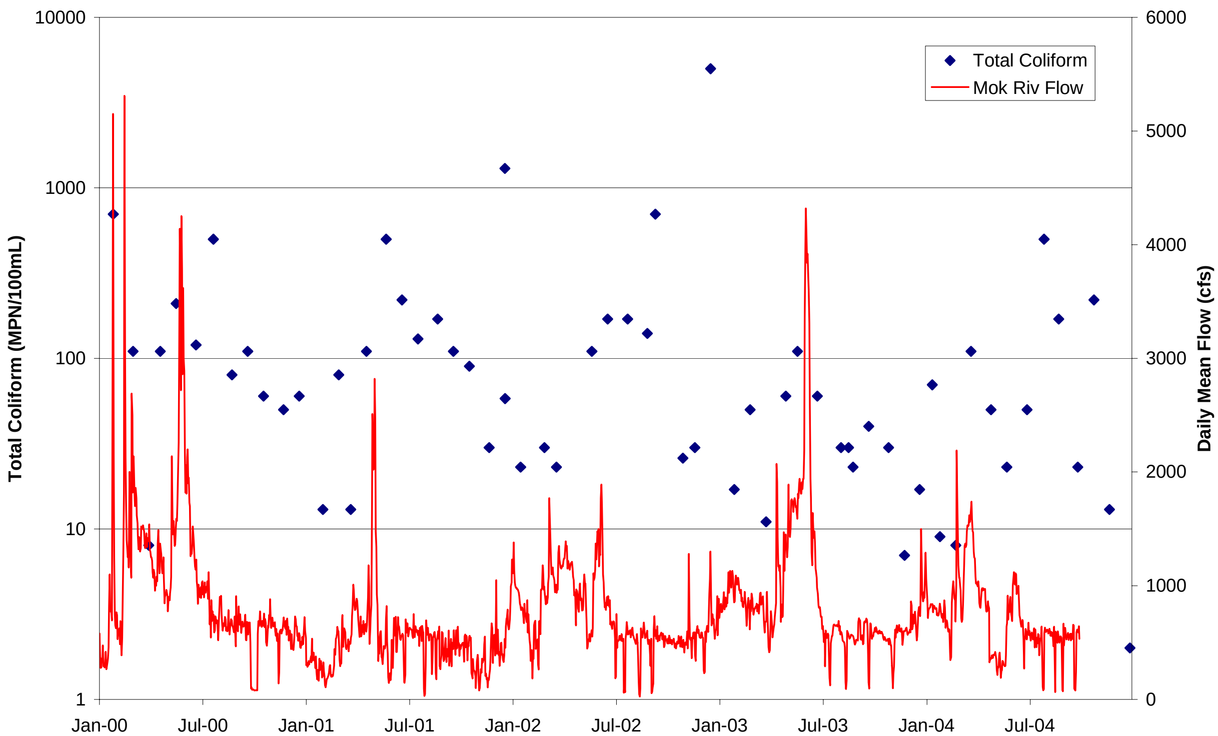


Figure 4-6: Mokelumne River Sampling (Highway 49) -- Fecal Coliform

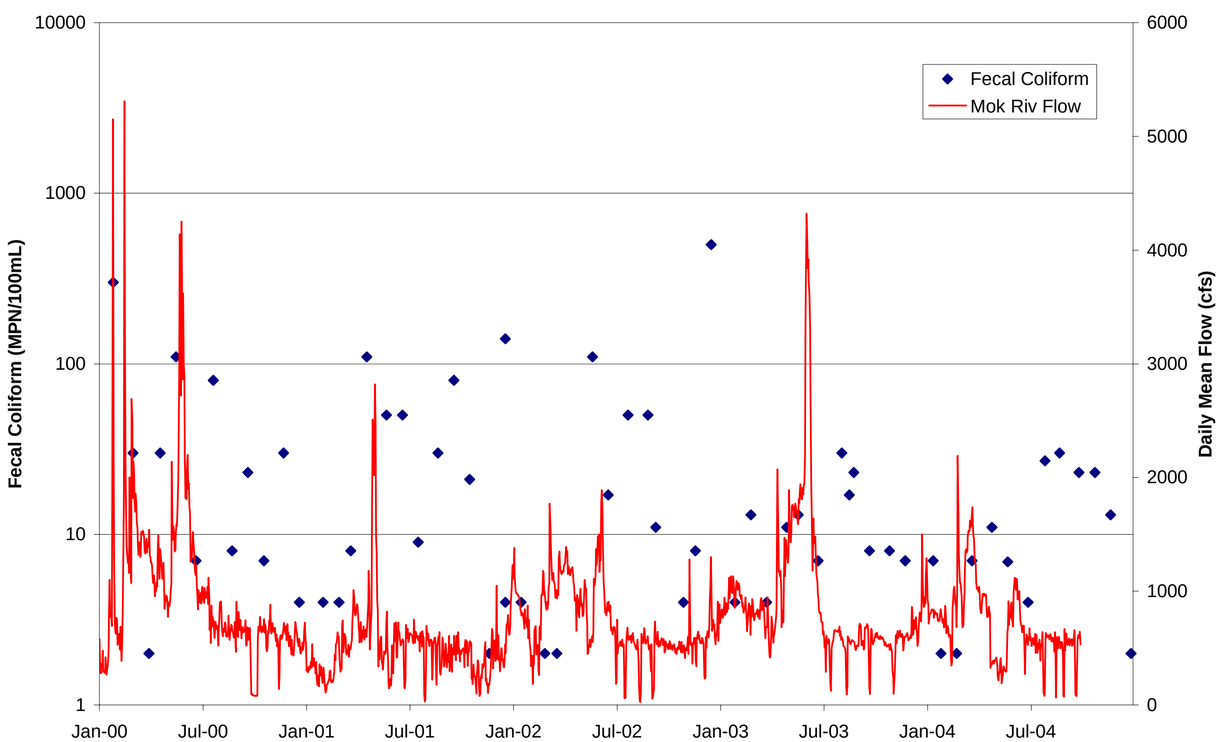


Figure 4-7: Mokelumne River Sampling (Highway 49) -- E.Coli

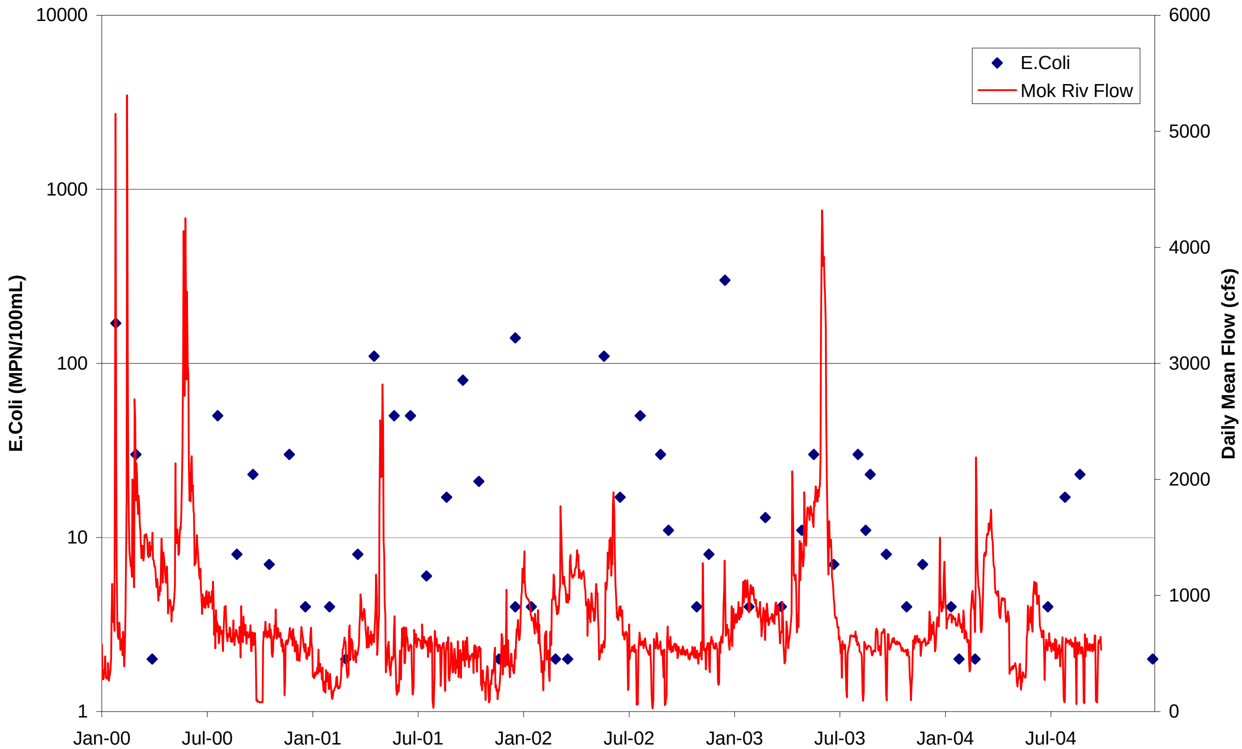
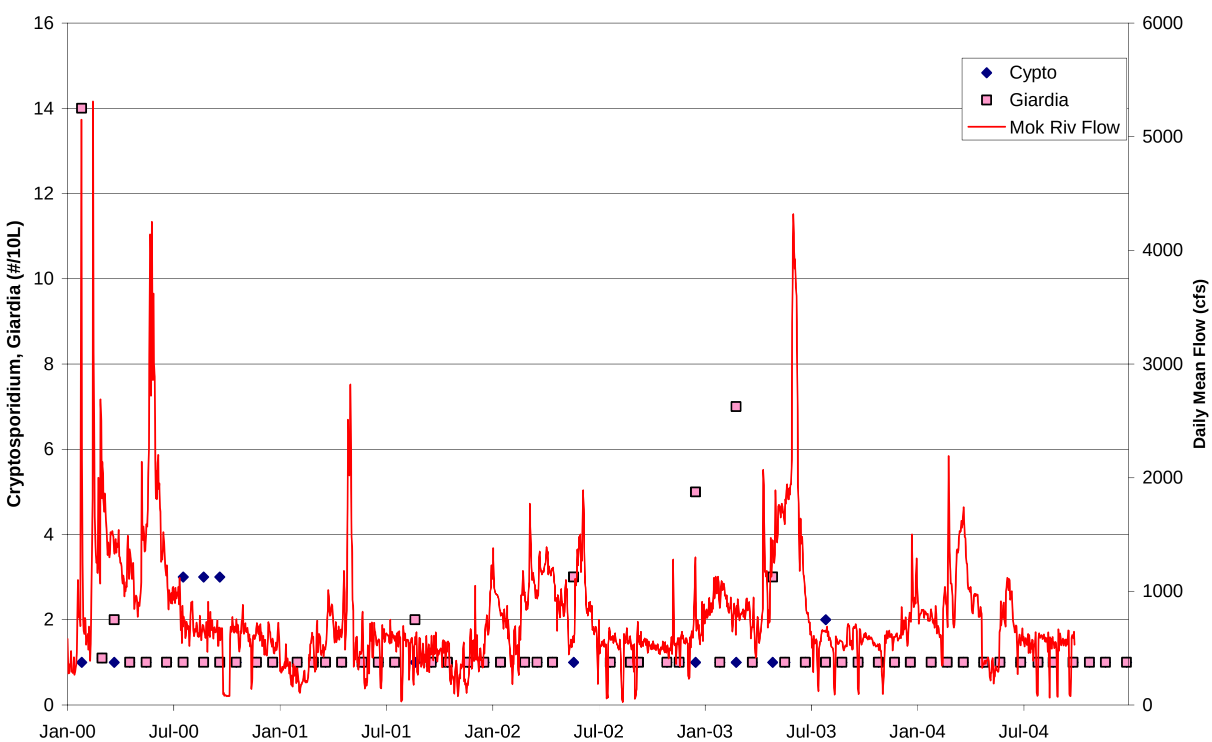


Figure 4-8: Mokelumne River Sampling (Highway 49) - Giardia and Cryptosporidium



An analysis of Figures 4-3 through 4-8 results in a number of observations relating to watershed conditions and activities. It is important to note that the flow depicted in each figure reflects the observed flow in the river, which represents the impacts due to precipitation, snowmelt, and diversions and releases associated with the extensive hydroelectric facilities along the Mokelumne River.

Seasonal fluctuations in turbidity from June 1999 until December 2004 are depicted, with elevated turbidities generally occurring during the winter months of January through March due to precipitation and runoff. The highest flows in this period occurred in winter of 2000 leading to a five-year turbidity high. TOC and DOC are almost always between 1 and 2 mg/L, with several measurements greater than 3 mg/L corresponding with high turbidity.

In general, as flow increases, total coliform, fecal coliform, and *E. coli* measurements initially increase due perhaps to surface runoff, then decrease as the concentrations get diluted with high river flow. The elevated concentrations compared to the last update period, may be due to drier weather, with less dilution. Still, Highway 49 sampling location is downstream of the Mokelumne Hill wastewater treatment plant and spray field, which may be a source of the higher microbiological levels. Elevated concentrations have previously been noted when effluent problems at the wastewater facility occurred. *Giardia* and *Cryptosporidium* concentrations are generally not detected, however significant concentrations occurred during the high turbidity winter of 2000.

Metals, nutrients, and planktons were found to be at low levels as expected. Herbicides/pesticides were not detected with a few exceptions of detection at trace level. All the results for the detected constituents were better than the drinking water quality standards.

Pardee Reservoir - Evaluation of Water Quality

In the following sections, existing Pardee raw water quality for all Title 22 parameters, other pertinent water quality parameters, apparent trends, and a comparison of raw and treated water to the drinking water standards are discussed.

Existing Raw Water Quality. Table 4-9 is a statistical summary of the raw water quality data required by Title 22 for Pardee Reservoir. The period of time reflected by the summary table is June 1999 to December 2004, since the 2000 update data collection cut-off date was May 1999. Maximum contaminant levels (MCLs) and detection limts for reporting (DLRs) are documented for each parameter along with minimum, median, and maximum statistics. In general, Pardee Reservoir water is considered a very soft water with a total hardness ranging from 6 to 34, with a median of 15 mg/L as $CaCO_3$. pH of the water ranged from 6.3 to 8.9 with a median value of 7.4. The color of the water was measured at 8 CU, which is well below the secondary standard of 15 CU.

Table 4-9: Pardee Reservoir Raw Water Monitoring – June 1999 thru Dec 2004

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
Microbiological Constituents							
Cryptosporidium	TT[1]	#/L	8	ND	ND	ND	NA
E.Coli	TCR[2]	MPN/100mL	224	ND	ND	50	NA
Fecal Coliforms	TCR[2]	MPN/100mL	236	ND	ND	50	NA
Giardia	TT[1]	#/L	8	ND	ND	ND	NA
Heterotrophic Plate Count	500	cfu/mL	NA	NA	NA	NA	NA
Legionella	TT[1]		NA	NA	NA	NA	NA
Total Coliforms	TCR[2]	MPN/100mL	244	8	ND	2400	NA
Turbidity	TT[1]	NTU	19	1	0.6	6	NA
Viruses	TT[1]		NA	NA	NA	NA	NA
Primary Standards -- Inorganic Chemicals							
Aluminum (Al)	1000	ug/L	99	32.6	ND	2100	50
Antimony (Sb)	6	ug/L	95	ND	ND	0.926	6
Arsenic (As)	50 [5]	ug/L	101	0.2	ND	0.6	2
Asbestos	7	mf/l	2	ND	ND	ND	0.2
Barium (Ba)	1000	ug/L	103	9.7	6.35	54	100
Beryllium (Be)	4	ug/L	103	ND	ND	0.345	1
Cadmium (Cd)	5	ug/L	105	ND	ND	0.44	1
Chromium (Cr)	50	ug/L	81	ND	ND	6.3	0.1
Copper (Cu)	TT[1]	ug/L	103	ND	ND	8.52	50
Cyanide (CN)	150	ug/L	NA	NA	NA	NA	100
Fluoride (F-)	2	mg/L	10	0.014	ND	0.03	0.1
Lead (Pb)	TT[1]	ug/L	102	ND	ND	5.36	5
Mercury (Hg)	2	ug/L	100	ND	ND	0.41	1
Nickel (Ni)	100	ug/L	91	0.399	ND	5.31	10
Nitrate (as N)	10	mg/L	188	ND	ND	0.12	NA
Nitrate (as NO_3)	45	mg/L	NA	NA	NA	NA	2
Nitrite (as N)	1	mg/L	107	ND	ND	0.004	0.4
Selenium (Se)	50	ug/L	71	ND	ND	2.33	5
Nitrate+Nitrite (as N)	10	mg/L	102	0.006	0	0.11	NA
Thallium (Tl)	2	ug/L	90	ND	ND	4.5	1
Primary Standards -- Non-volatile Organic Chemicals (SOCs)							
2,4-D	70	ug/L	6	ND	ND	ND	10
2,4,5-TP (Silvex)	50	ug/L	6	ND	ND	ND	1
2,3,7,8-TCDD (Dioxin)	30	pg/L	2	ND	ND	ND	0.000005
Alachlor (Alanex)	2	ug/L	63	ND	ND	ND	1
Atrazine (Aatrex)	1	ug/L	61	ND	ND	ND	0.5
Bentazon (Basagran)	18	ug/L	6	ND	ND	ND	2
Benzo(a)pyrene	0.2	ug/L	4	ND	ND	ND	10
Di(2-ethylhexyl)adipate	400	ug/L	4	ND	ND	ND	5
Di(2-ethylhexyl)phthalate	4	ug/L	NA	NA	NA	NA	3
Carbofuran	18	ug/L	3	ND	ND	ND	5

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
Chlordane	0.1	ug/L	3	ND	ND	ND	0.1
Dalapon	200	ug/L	6	ND	ND	ND	10
Polychlorinated Biphenyls (PCB's)	0.5	ug/L	2	ND	ND	ND	0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	14	ND	ND	ND	NA
Dinoseb (DNBP)	7	ug/L	6	ND	ND	ND	2
Diquat	20	ug/L	2	ND	ND	ND	4
Endothall	100	ug/L	1	ND	ND	ND	45
Endrin	2	ug/L	2	ND	ND	ND	0.1
Ethylene Dibromide (EDB)	0.05	ug/L	14	ND	ND	ND	0.02
Lindane	0.2	ug/L	2	ND	ND	ND	0.2
Glyphosate	700	ug/L	4	ND	ND	ND	25
Heptachlor	0.01	ug/L	1	ND	ND	ND	0.01
Heptachlor Epoxide	0.01	ug/L	2	ND	ND	ND	0.01
Hexachlorobenzene	1	ug/L	6	ND	ND	ND	0.5
Hexachlorocyclopentadiene	50	ug/L	6	ND	ND	ND	1
Methoxychlor	30	ug/L	2	ND	ND	ND	10
Molinate	20	ug/L	40	ND	ND	ND	2
Oxamyl (Vydate)	50	ug/L	3	ND	ND	ND	20
Pentachlorophenol (PCP)	1	ug/L	10	ND	ND	ND	0.2
Picloram	500	ug/L	6	ND	ND	ND	1
Simazine	4	ug/L	49	ND	ND	ND	1
Thiobencarb	70	ug/L	59	ND	ND	ND	1
Toxaphene	3	ug/L	3	ND	ND	ND	1
Primary Standards -- Radioactivity							
Gross Alpha	15	pCi/L	6	---	0	3	3
Gross Beta	50	pCi/L	5	---	0	8	4
Radium 226 + Radium 228, combined	5	pCi/L	NA	NA	NA	NA	NA
Strontium	8	pCi/L	1	---	0	0.21	2
Tritium	20000	pCi/L	1	---	0	508.7	1000
Uranium	20	pCi/L	6	---	0	1.526	1
Disinfectant/Disinfection Byproducts Rule							
Chlorine as Cl_2	4	mg/L	NA	NA	NA	NA	NA
Chloramines as Cl_2	4	mg/L	NA	NA	NA	NA	NA
Chlorine Dioxide	0.8	mg/L	NA	NA	NA	NA	NA
Dichlorobromomethane		ug/L	499	ND	ND	3.4	0.5
Bromoform		ug/L	497	ND	ND	ND	0.5
Chloroform		ug/L	498	ND	ND	39	0.5
Dibromochloromethane		ug/L	498	ND	ND	ND	0.5
Total Trihalomethanes	80	ug/L	calc	ND	ND	42.4	NA
HAA5	60	ug/L	NA	NA	NA	NA	NA
Bromate	10	ug/L	NA	NA	NA	NA	0.005
Chlorite	1	mg/L	NA	NA	NA	NA	0.02

Primary Standards -- Volatile Organic Chemicals VOCs)							
Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
1,1,1-Trichloroethane (1,1,1-TCA)	200	ug/L	496	ND	ND	ND	0.5
1,1,2,2-Tetrachloroethane	1	ug/L	499	ND	ND	ND	0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	1200	ug/L	484	ND	ND	ND	10
1,1,2-Trichloroethane (1,1,2-TCA)	5	ug/L	499	ND	ND	ND	0.5
1,1-Dichloroethane (1,1-DCA)	5	ug/L	499	ND	ND	ND	0.5
1,1-Dichloroethylene (1,1-DCE)	6	ug/L	498	ND	ND	ND	0.5
1,2,4-Trichlorobenzene	5	ug/L	499	ND	ND	ND	0.5
1,2-Dichlorobenzene (o-DCB)	600	ug/L	499	ND	ND	ND	0.5
1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	495	ND	ND	ND	0.5
1,2-Dichloropropane	5	ug/L	499	ND	ND	ND	0.5
1,3-Dichloropropene (TOTAL)	0.5	ug/L	497	ND	ND	ND	0.5
1,4-Dichlorobenzene (p-DCB)	5	ug/L	499	ND	ND	ND	0.5
Benzene	1	ug/L	499	ND	ND	0.22	0.5
Carbon Tetrachloride	0.5	ug/L	497	ND	ND	ND	0.5
cis-1,2-Dichlorethylene (c-1,2-DCE)	6	ug/L	498	ND	ND	ND	0.5
cis-1,3-Dichloropropene	0.5	ug/L	499	ND	ND	ND	0.5
Ethylbenzene	300	ug/L	499	ND	ND	0.26	0.5
Trichlorofluoromethane (Freon 11)	150	ug/L	493	ND	ND	ND	5
Dichloromethane (Methylene Chloride)	5	ug/L	498	ND	ND	ND	NA
Methyl-tert-butyl ether (MTBE)	13	ug/L	491	ND	ND	3.9	3
Monochlorobenzene (Chlorobenzene)	70	ug/L	499	ND	ND	ND	0.5
Styrene	100	ug/L	497	ND	ND	ND	0.5
Tetrachloroethylene	5	ug/L	493	ND	ND	ND	0.5
Toluene	150	ug/L	499	ND	ND	1	0.5
trans-1,2-Dichloroethylene (t-1,2-DCE)	10	ug/L	498	ND	ND	ND	0.5
trans-1,3 Dichloropropene	0.5	ug/L	498	ND	ND	ND	0.5
Trichloroethylene (TCE)	5	ug/L	499	ND	ND	ND	0.5
Vinyl Chloride (VC)	0.5	ug/L	490	ND	ND	ND	0.5
Xylenes (total)	1750	ug/L	497	ND	ND	1.2	NA
Lead and Copper Rule (Action Level)							
Copper (Cu)	1300	ug/L	103	ND	ND	8.52	50
Lead (Pb)	15	ug/L	102	ND	ND	5.36	5
Secondary Standards							
Aluminum (Al)	200	ug/L	99	32.6	ND	2100	50
Chloride (Cl)	600	mg/L	63	1.5	1.1	2.9	NA

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
Color	15	color unit	1	8	8	8	NA
Specific Conductance	2200	u-omhs	3	35.7	30.1	45.9	NA
Copper (Cu)	1000	ug/L	103	ND	ND	8.52	50
Iron (Fe)	300	ug/L	97	72.7	12.1	937	100
Manganese (Mn)	50	ug/L	102	9.2	2.45	86.7	NA
Foaming Agents (MBAS)	0.5	mg/L	1	ND	ND	ND	NA
Methyl-tert-butyl ether (MTBE)	5	ug/L	491	ND	ND	3.9	3
pH	6.5-8.5	pH units	70	7.42	6.29	8.85	NA
Silver (Ag)	100	ug/L	100	ND	ND	0.08	10
Sulfate	600	mg/L	16	1.2	0.8	1.8	0.5
Thiobencarb	1	ug/L	59	ND	ND	ND	1
Odor--Threshold	3	TON	1	2.1	2.1	2.1	1
Total Dissolved Solids	1500	mg/L	40	32	12	61	NA
Turbidity	5	NTU	543	0.82	0.12	78	0.1
Zinc (Zn)	5000	ug/L	86	2.34	ND	23.1	50
CDHS Drinking Water Notification Levels							
1,2,3-Trichloropropane	0.005	ug/L	14	ND	ND	ND	0.005
1,2,4-Trimethylbenzene	330	ug/L	494	ND	ND	0.39	0.5
1,3,5-Trimethylbenzene	330	ug/L	496	ND	ND	0.13	0.5
1,4-Dioxane	3	ug/L	NA	NA	NA	NA	3
Methyl isobutyl ketone (MIBK)	120	ug/L	497	ND	ND	ND	5
Boron	1000	ug/L	87	3.91	ND	17.6	100
Carbon Disulfide	160	ug/L	474	ND	ND	12	0.5
Chlorate	800	ug/L	NA	NA	NA	NA	20
Dichlorodifluoromethane	1000	ug/L	476	ND	ND	ND	0.5
Ethylene Glycol (anti-freeze)	14	mg/L	NA	NA	NA	NA	NA
Formaldehyde	100	ug/L	NA	NA	NA	NA	NA
Isopropylbenzene (Cumene)	770	ug/L	497	ND	ND	ND	0.5
Manganese (Mn)	500	ug/L	102	9.2	2.45	86.7	20
Naphthalene	17	ug/L	498	ND	ND	0.28	0.5
N-Butylbenzene	260	ug/L	499	ND	ND	0.13	0.5
N-Nitrosodiethylamine	210	ng/L	NA	NA	NA	NA	0.002
N-Nitrosodimethylamine (NDMA)	10	ng/L	NA	NA	NA	NA	0.002
Propylbenzene (n)	260	ug/L	493	ND	ND	ND	NA
2-Chlorotoluene	140	ug/L	497	ND	ND	ND	0.5
4-Chlorotoluene	140	ug/L	498	ND	ND	ND	0.5
Perchlorate	6	ug/L	4	ND	ND	ND	4
sec-Butylbenzene	260	ug/L	493	ND	ND	ND	0.5
Tertiary-butyl alcohol	12	ug/L	196	ND	ND	ND	2
tert-Butylbenzene	260	ug/L	492	ND	ND	ND	0.5
Vanadium	50	ug/L	20	ND	ND	16.5	3

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
CDHS Archived Advisory Levels							
Aldicarb	7	ug/L	3	ND	ND	ND	3
Aldrin	0.000002	mg/L	NA	NA	NA	NA	0.075
Baygon	30	ug/L	3	ND	ND	ND	NA
a-Benzene Hexachloride	0.000015	mg/L	NA	NA	NA	NA	NA
b-Benzene Hexachloride	0.025	ug/L	2	ND	ND	ND	NA
Captan	0.0015	mg/L	NA	NA	NA	NA	0.1
Carbaryl	700	ug/L	3	ND	ND	ND	5
Chloropicrin	0.056	mg/L	NA	NA	NA	NA	1
Chlorpropham (CIPC)	1.2	mg/L	NA	NA	NA	NA	NA
Diazinon	6	ug/L	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	600	ug/L	519	ND	ND	ND	0.5
Dieldrin	0.000002	mg/L	NA	NA	NA	NA	0.00002
Dimethoate	1	ug/L	61	ND	ND	0.028	NA
2,4-Dimethylphenol	0.1	mg/L	NA	NA	NA	NA	0.005
Diphenamide	0.2	mg/L	NA	NA	NA	NA	0.1
Ethion	0.004	mg/L	NA	NA	NA	NA	NA
Malathion	0.16	mg/L	NA	NA	NA	NA	NA
N-Methyl dithiocarbamate (Metam sodium)	0.02	mg/L	NA	NA	NA	NA	NA
Methylisothiocyanate	0.05	mg/L	NA	NA	NA	NA	NA
Methyl parathion	2	ug/L	NA	NA	NA	NA	NA
Parathion	0.04	mg/L	NA	NA	NA	NA	0.02
Pentachloronitrobenzene	0.02	mg/L	NA	NA	NA	NA	NA
Phenol	4.2	mg/L	1	ND	ND	ND	0.005
2,3,5,6-Tetrachloroterephthalate	3500	ug/L	2	ND	ND	ND	NA
Trithion	0.007	mg/L	NA	NA	NA	NA	NA
Unregulated Contaminant -- List 1							
2,4-dinitrotoluene		ug/L	7	ND	ND	ND	5
2,6-dinitrotoluene		ug/L	8	ND	ND	ND	5
4,4'-DDE		ug/L	6	ND	ND	0.0048	0.01
Acetochlor		ug/L	4	ND	ND	ND	NA
DCPA, Total mono & di acid*		ug/L	10	ND	ND	ND	NA
EPTC		ug/L	40	ND	ND	ND	NA
Nitrobenzene		ug/L	474	ND	ND	ND	5
Terbacil		ug/L	16	ND	ND	ND	NA
Other Parameters							
Alkalinity (HCO_3)		mg/L	3	13.1	13	16	NA
Alkalinity (CO_3)		mg/L	3	ND	ND	0.1	NA
Hydroxide Alkalinity		mg/L	3	ND	ND	ND	NA
Total Alkalinity (As $CaCO_3$)		mg/L	71	15	12	24	NA
Total Hardness		mg/L	131	15	6	34	NA
Magnesium (Mg)		ug/L	88	869	448	2490	NA
Orthophosphate (as P)		mg/L	180	ND	ND	0.39	NA

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
Silica		ug/L	86	4075	2490	7900	NA
Sodium (Na)		ug/L	98	1985	1330	4000	NA
SUVA		L/mg-m	4	2.1	1.5	2.5	NA
Total Organic Carbon		mg/L	79	1.6	1.2	2.8	0.3
Total Phosphate (as P)		mg/L	122	0.018	0.005	0.12	NA
Calcium (Ca)		ug/L	85	3460	2030	12300	NA
Chromium VI		ug/L	NA	NA	NA	NA	1
Ethyl-tert-butyl-ether		ug/L	495	ND	ND	ND	3
tert-Amyl-methyl ether		ug/L	495	ND	ND	ND	3
Bromide		mg/L	15	ND	ND	0.02	NA

[1]Treatment Technique (TT)

• *Cryptosporidium* (as of 1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
• *Giardia lambia*: 99.9% removal/inactivation
• Viruses: 99.99% removal/inactivation
• *Legionella*: No limit, but USEPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
• Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelolometric turbidity units (NTU) ; systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, for systems servicing >10,000, and January 14, 2005, for systems servicing <10,000, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.
• Lead and Copper: if more than 10% of tap water samples exceed the action levels, water systems must take additional steps.

[2]No more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or E. coli. If two consecutive TC-positive samples, and one is also positive for *E. Coli* or fecal coliforms, the system has an acute MCL violation.

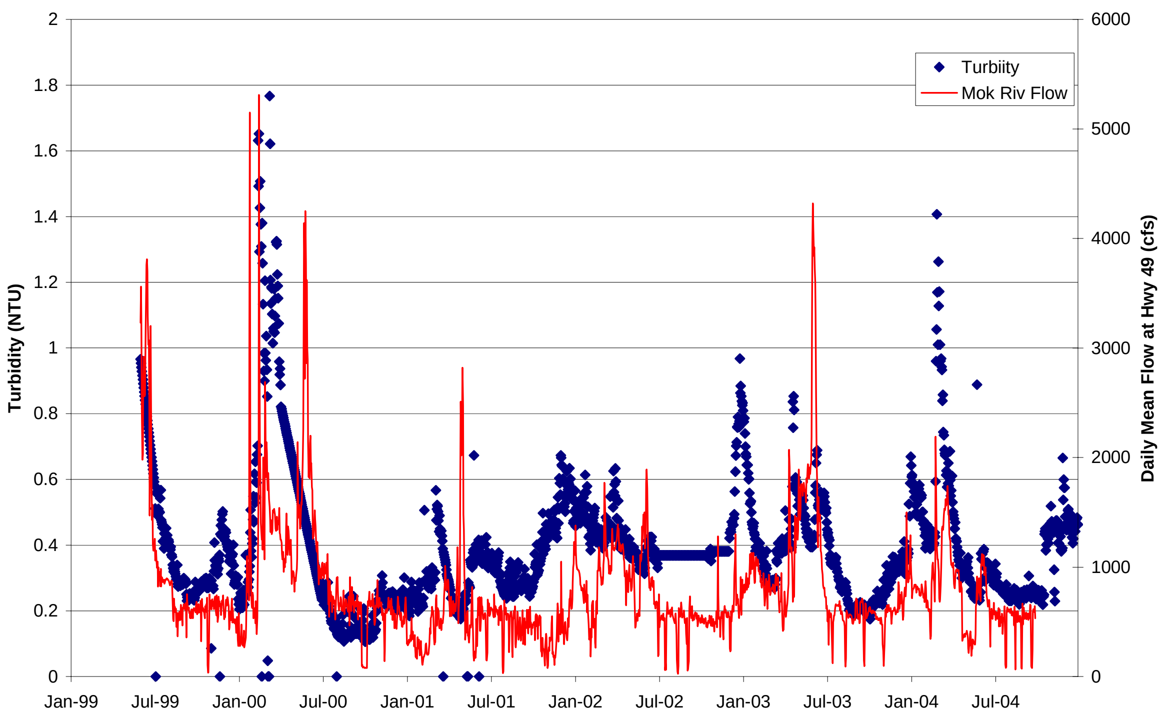
[3]NA = Data Not Available

[4]ND = Not Detected (i.e. value is below detection limit).

[5]Arsenic MCL = 50 ug/L at the time of sampling. After January 2006, the Arsenic MCL is 10 ug/L.

Turbidity. The turbidity data collected at the Pardee Reservoir ranged from 0.6 to 6 NTU with a median value of 1 NTU. These data indicate that Pardee Reservoir generally has very low turbidity water with occasional spikes of moderate turbidity. Additional turbidity data collected in the Mokelumne Aqueduct, which transports Pardee reservoir water, at the Campo Seco monitoring station are depicted in Figure 4-9. The daily average turbidity reflected in this figure was collected by an on-line analyzer and extracted from the District's SCADA system. A maximum turbidity of 1.77 NTU, with a median value of 0.37 NTU were analyzed at this station. The peak turbidities again correlate to high flows as measured at Highway 49 station. The lower turbidity at Campo Seco reflects settling out of sediments in the reservoir and optimum gate selection.

Figure 4-9: Mokelumne Aqueduct Turbidity at Campo Seco



Microbiological. For both small systems and large systems, the District monitors several microbiological parameters in the raw water of the Pardee Reservoir including: total coliforms, fecal coliforms, *E. coli*, *Giardia*, and *Cryptosporidium*. Figure 4-10, depicts raw water total coliform count versus time for the monitoring period of June 1999 to December 2004. The frequency distribution for this data set is depicted in Figure 4-11. The data indicate that Pardee Reservoir had a total coliform count below 100 MPN/100 mL, 93 percent of the time, with a median value of 8 MPN/100 mL. Median values for both fecal coliforms and *E. coli* were non-detect with the same maximum values of 50 MPN/100 mL.

Figure 4-10: Pardee Reservoir Total Coliform Monitoring

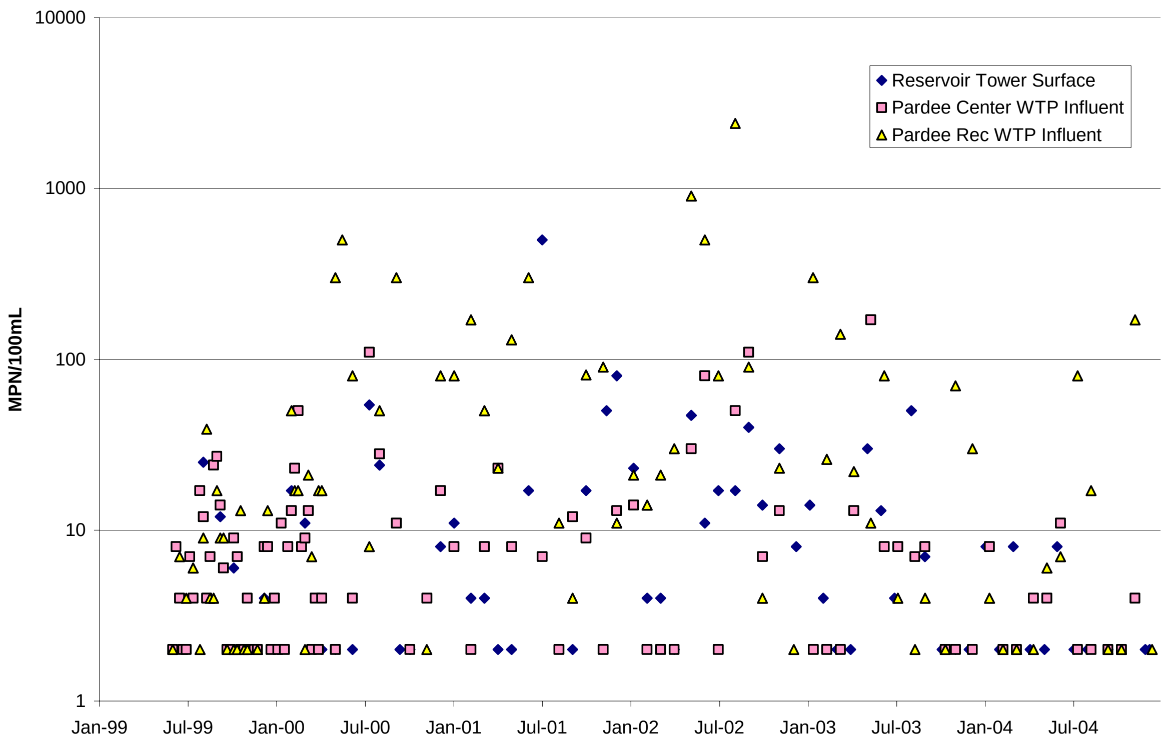
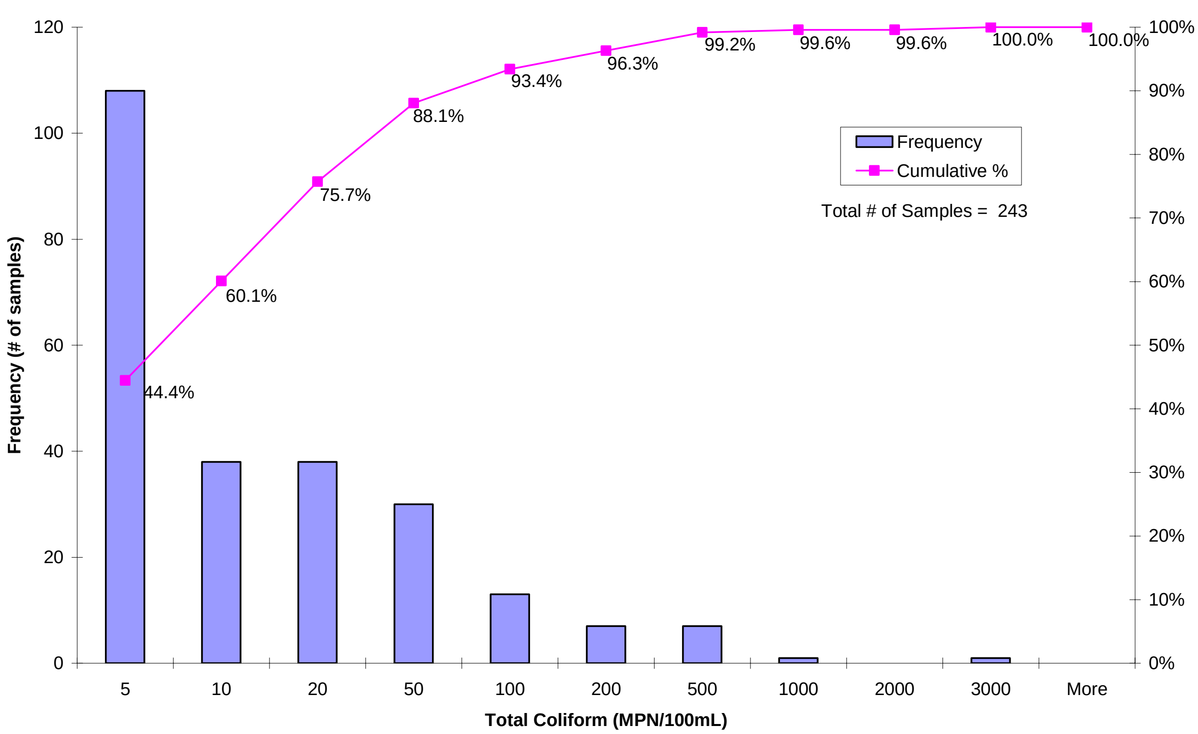


Figure 4-11: Frequency and Cumulative Distribution of Total Coliform at Pardee Reservoir



Giardia and *Cryptosporidium* monitoring at Pardee Resevoir is done at the Pardee Center WTPs intake. Based on the data presented in Table 4-10, *Giardia* and *Cryptosporidium* have so far not been detected in Pardee Reservoir in the past five years, when compared to data from the previous update. The low microbiological counts for total coliforms, fecal coliforms, *E. coli*, *Giardia*, and *Cryptosporidium* indicate that Pardee Reservoir stores high quality water.

Table 4-10: Pardee Reservoir *Cryptosporidium* and *Giardia* Monitoring

Site	Locator	Collection Date	*Giardia* (#/10L)	Crypto (#/10L)	DLR (#/10L)
Pardee Cntr WTP	Influent	28-Sep-99	ND	ND	1
Pardee Cntr WTP	Influent	21-Mar-00	ND	ND	1
Pardee Cntr WTP	Influent	26-Sep-00	ND	ND	1
Pardee Cntr WTP	Influent	27-Mar-01	ND	ND	1
Pardee Cntr WTP	Influent	27-Sep-01	ND	ND	1
Pardee Cntr WTP	Influent	26-Mar-02	ND	ND	1
Pardee Cntr WTP	Influent	23-Sep-02	ND	ND	1
Pardee Cntr WTP	Influent	22-Jul-03	ND	ND	1

General Minerals and Inorganics. The general minerals and inorganic chemicals present in the Pardee Reservoir are very low. For example, as Table 4-9 highlights, the median concentration of total dissolved solids (TDS) is only 32 mg/L and total alkalinity is 15 mg/L as $CaCO_3$.

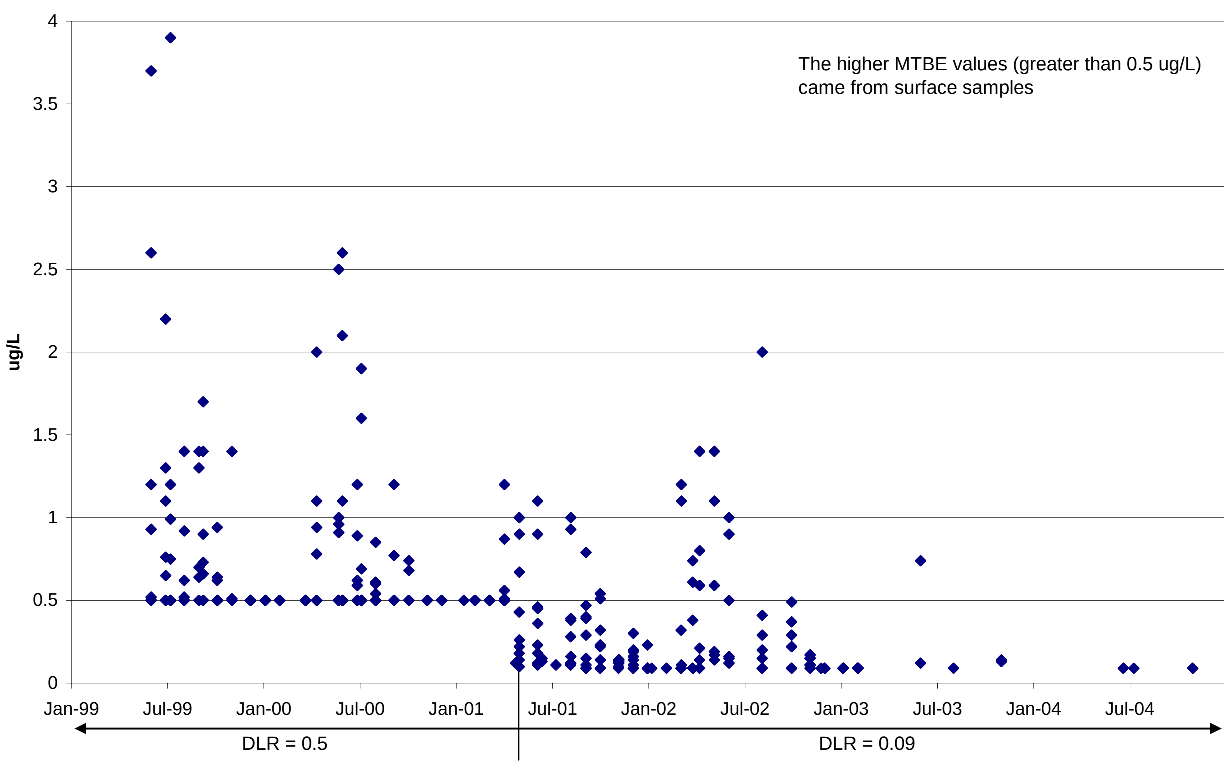
The five-year water quality monitoring indicates that the median concentrations of the inorganic primary and secondary drinking water contaminants have been non-detect or well below the USEPA and CDHS MCLs. Raw water aluminum had a maximum value of 2.1 mg/L, which is well over the primary drinking water MCL of 1 mg/L. However, the median raw water concentration for aluminum was only 0.033 mg/L. In addition, the raw water maximum value for iron was 0.937 mg/L, well above the secondary drinking water MCL of 0.3 mg/L. However, similar to aluminum, the median value for iron was quite low at 0.073 mg/L, suggesting that the maximum value reflects an infrequent excursion. Maximum values of aluminum and iron exceeded MCL in the previous update as well. It is important to remember that MCLs apply to treated water quality. The raw water quality is being evaluated using treated water MCLs as a benchmark and potential guide for treatment operations only.

The arsenic MCL is expected to be reduced to a concentration of 10 µg/L by USEPA in 2006, the District regularly monitors this parameter. The median arsenic level at Pardee Reservoir was 0.2, with a range from non-detect to 0.6 µg/L during the June 1999 through December 2004 monitoring period.

Regulated Organics. As Table 4-9 indicates, the maximum concentrations of all the regulated SOCs and VOCs monitored in Pardee Reservoir water were non-detects or well below drinking water MCLs.

Based on monitoring initiated in 1995, the District has infrequently detected MTBE in Pardee Reservoir (Figure 4-12). MTBE has ranged from non-detect to 3.9 µg/L with a median value of non-detect, all of which are below the secondary MCL of 5 ug/L. The high concentrations reflect samples collected near the marina.

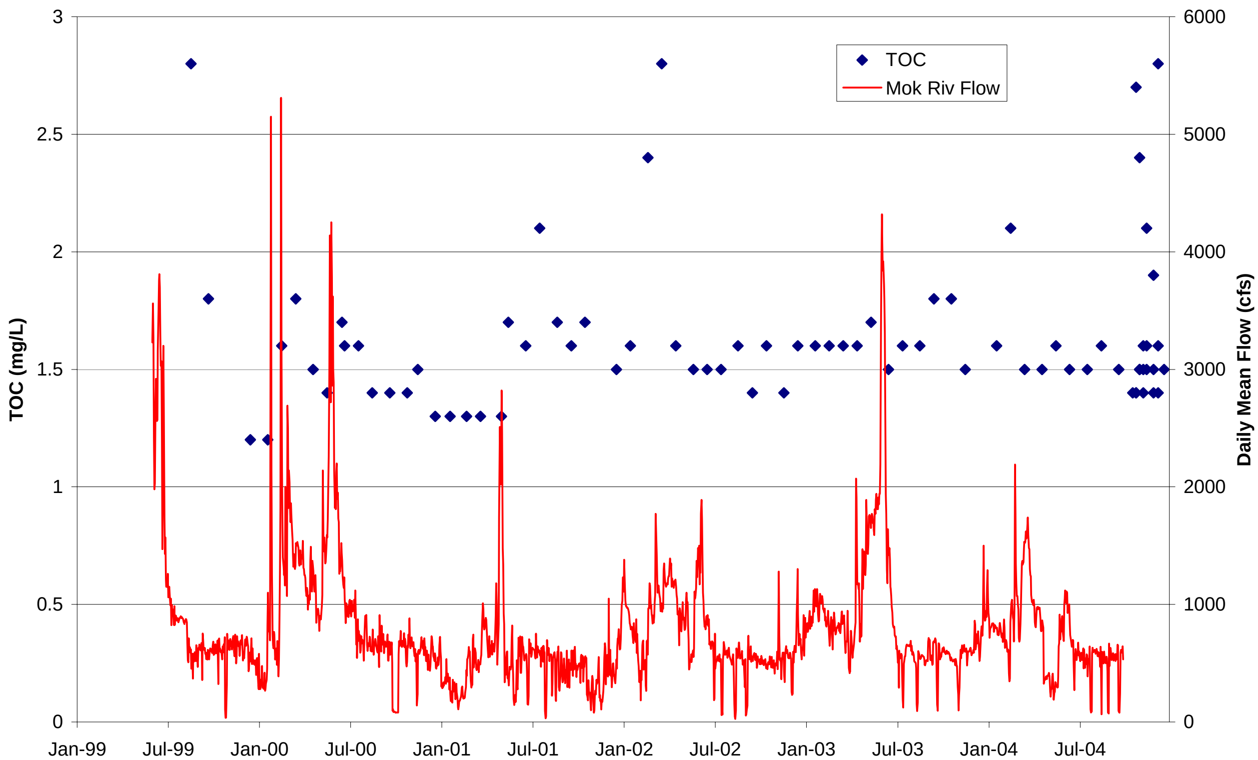
Figure 4-12: Pardee Reservoir MTBE Monitoring



Radioactivity. As shown in Table 4-9, the maximum values of the measured radioactivity parameters are well below the MCLs.

Total Organic Carbon. Figure 4-13 depicts TOC monitoring data from June 1999 through December 2004 for Pardee Reservoir. As the figure indicates, TOC concentrations are below 3 mg/L. The five years of water TOC data summarized in Table 4-9, indicate a range of 1.2 to 2.8 mg/L with a median value of 1.6 mg/L.

Figure 4-13: Pardee Reservior TOC Monitoring



Taste & Odor. Results of algae sampling at Pardee Reservoir from June 1999 through December 2004 are summarized in Table 4-11. This table highlights those algae whose counts were greater than 1,000 colonies or cells per 100 mL. A number of the algae summarized in Table 4-11 are associated with filter clogging problems at WTPs and taste and odor (T&O_ incidences, particularly *Fragillaria*.

Table 4-11: Algal Species Detected in Pardee and Camanche Reservoirs

Algae Class	Water Quality or Treatment Concern	Potential Odor	Potential Taste	Pardee	Camanche
Bacillariophyceae (Diatoms)					
Acnanthes					X
Asterionella	Filter-clogging, odor	Spicy, geranium		X	X
Cocconeis					X
Cyclotella	Filter-clogging, odor	Grassy, spicy, geranium		X	X
Cymbella	Filter-clogging			X	
Fragillaria	Filter-clogging, odor	Grassy, spicy, geranium		X	X
Melosira	Filter-clogging, odor, taste	Grassy, spicy, geranium	Sickly sweet, oily	X	X
Navicula	Filter-clogging			X	X
Nitzschia				X	X
Rhizosolenia				X	X
Stephanodiscus	Filter-clogging, odor, taste	Grassy, spicy, geranium	Sickly sweet, oily	X	X
Synedra	Filter-clogging, odor, taste	Grassy	Sickly sweet, oily	X	X

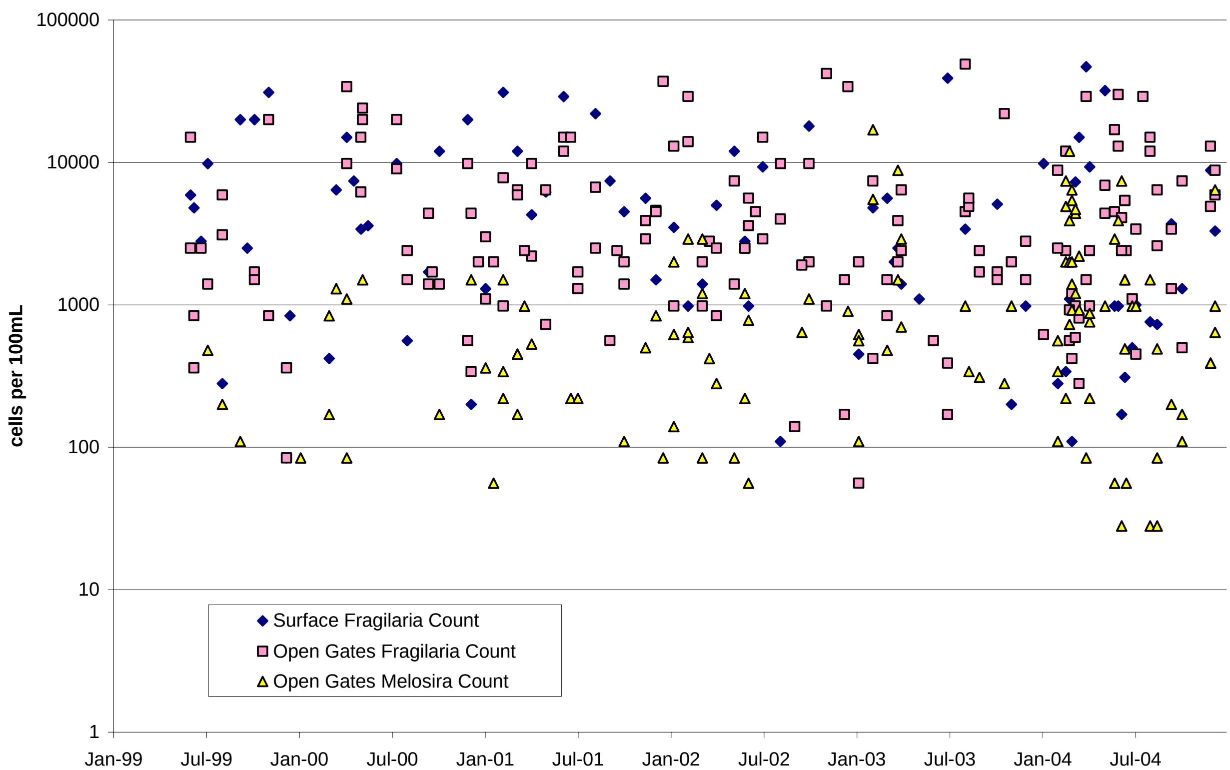
Algae Class	Water Quality or Treatment Concern	Potential Odor	Potential Taste	Pardee	Camanche
Tabellaria	Odor	Grassy, spicy, geranium		X	
Chlorophyceae					
Ankistrodesmus	Odor	Grassy, musty in large quantities		X	X
Coelastrum				X	X
Crucigenia				X	X
Elakatothrix	Odor	Grassy, nasturtium		X	X
Eudorina	Odor	Fishy in large quantities		X	X
Gonium	Odor	Fishy in large quantities		X	X
Hormidium					X
Oocystis				X	
Nephrocytium				X	
Palmella	Filter-clogging			X	X
Pediastrum	Odor	Grassy in large quantities			X
Scenedesmus	Odor	Grassy in large quantities		X	X
Schroederia				X	X
Sphaerocystis				X	X
Spirogyra	Filter-clogging, odor	Grassy in large quantities		X	
Spondylosium				X	X
Tetraedron					X
Ulothrix	Odor	Grassy in large quantities		X	
Chrysophyceae					
Dinobryon	Taste, odor	Violets, fishy	Sickly sweet, oily	X	X
Mallomonas	Taste, odor	Violets	Bitter		X
Cyanophyceae (*Myxophyceae*)					
Agmenellum				X	X
Anabaena	Filter-clogging, odor	Grassy, musty, nasturtium		X	X
Anacystis	Taste, odor	Grassy, musty	Sweet	X	X
Aphanizomenon	Taste, odor	Grassy, musty, nasturtium	Sweet	X	X
Coccochloris				X	X
Oscillatoria	Filter-clogging, odor	Musty, spicy		X	
Dinophyceae					
Ceratium	Taste, odor	Fishy	Bitter	X	X
Gymnodinium				X	X
Peridinium	Odor	Cucumber			X
Zooflagellates					
Aulomonas				X	X
Cladomonas					X
Codomonas					X

Notes: Algae listed are samples collected from June 1999 to December 2004, which measured more than 1,000 colonies or cells per 100 mL.
(1) *Anabaena* SCA (c), SCA (s), and MCA.
Odor description based on moderate quantities of algae, unless otherwise noted.

Sources: EBMUD, 2005
AWWA, Lyonnaise, Des Eaux. Identification and Treatment of Tastes and Odors in Drinking Water, 1987.
APHA, AWWA, WEF, Standard Methods for the Examination of Water and Wastewater, 1992.

While it varies between algal species, to produce odorous metabolites of a high enough concentration to result in a noticeable T&O incident, algal counts of 10,000 to well over 100,000 cells per 100 mL would have to occur. For example, the critical concentration of *Melosira* that would produce odorous metabolites is 250,000 cells per 100 mL (Seppovaara, 1971). As shown in Figure 4-14, the level of *Melosira* in Pardee reservoir is well below this critical concentration. No taste and odor problems associated with Pardee Reservoir water were documented during the past five years.

Figure 4-14: Pardee Reservoir Algae Monitoring



To result in filter clogging problems, depending upon algal species, lower counts of 1,000s to 10,000s cells per 100 mL may be all that is required. Direct-filtration plants in the East Bay have experienced shorter filter run times during *Flagillaria* blooms. Because diatoms have a competitive advantage over other algae at low temperature, their blooms can also occur during fall/winter months (Horne and Goldman, 1994).

Trends in Water Quality. Whether potential trends or relationships between watershed conditions and water quality can be extracted from current water quality monitoring programs, monthly precipitation and turbidity. These were plotted for Pardee Center WTP (Figure 4-15) and Pardee Recreation Area WTP (Figure 4-16). As shown in these figures, a correlation is suggested between rainfall events and elevated (raw water) turbidity at the Pardee Reservoir. However, the data depicts the treatment performance of the Pardee Center and Pardee Recreation Area WTPs as shown by the relatively consistent treated water turbidity that is produced whether or not there is a raw water turbidity spike caused by a rainfall event. For the District's Walnut Creek, Lafayette, and Orinda in-line WTPs that treat Mokelumne River water diverted from Pardee Reservoir, high turbidity events pose operational difficulties. Operational procedures have been developed to mitigate the impact of turbidity spikes on treatment plant operations at these WTPs.

Figure 4-15: Pardee Center WTP Raw and Treated Turbidity and Pardee Reservoir Precipitation

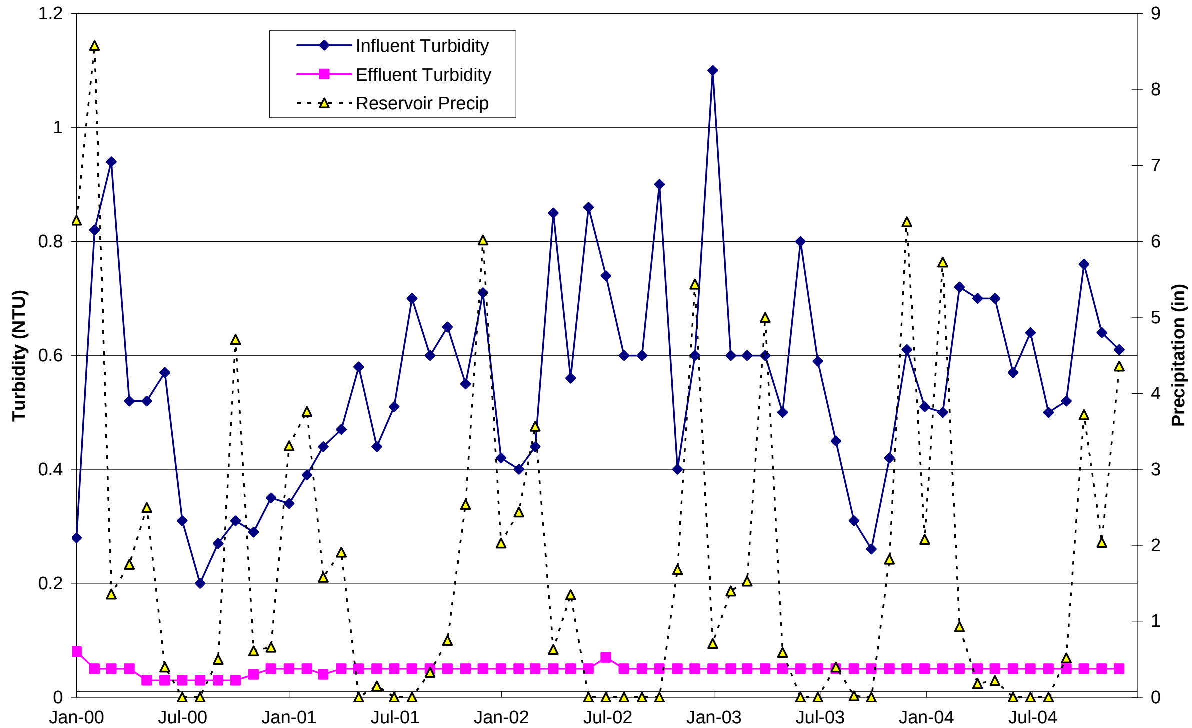
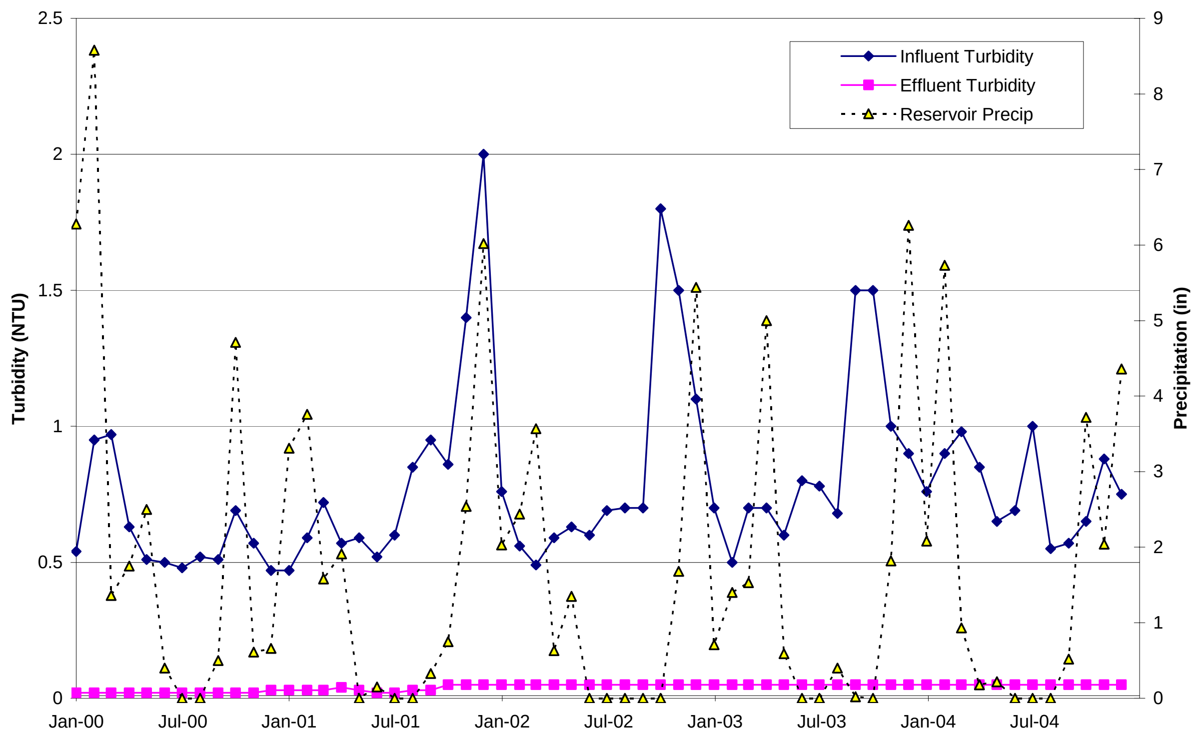


Figure 4-16: Pardee Recreation Area WTP Raw and Treated Turbidity and Pardee Reservoir Precipitation



Although Pardee Reservoir data do not reflect distinct fluctuations in total coliform levels, as were detected in the Mokelumne River tributaries to Pardee Reservoir, the results of the tributary monitoring can be used as a basis for developing a better understanding of the impacts of watershed activities on water quality. Continued monitoring of the tributaries is important to the overall monitoring database for Pardee Reservoir.

Comparison of Raw/Treated Water to Standards. The District's annual Consumer Confidence Reports (CCRs) for the large systems -- Walnut Creek, Lafayette, and Orinda WTPs -- present treated water distribution system-wide averages for many of the regulated parameters discussed herein. CCRs for the small water systems -- Pardee Center and Pardee Recreation Area WTPs -- document distribution system-wide averages for the pertinent water quality parameters. The CCRs from 2000 through 2004 are provided in Appendix B. Monthly summaries of WTP operations were used to evaluate the corresponding treated and finished water qualities.

Raw water in the Pardee Reservoir generally met treated water quality standards, with the exception of five parameters: turbidity, aluminum, thallium, iron, and manganese. For aluminum, thallium, iron, and manganese, the median concentrations were well below the respective primary and secondary MCLs for treated water. The maximum concentrations reported for these parameters were above these standards suggesting occasional but infrequent elevated levels occur. None of these parameters occurs at concentrations above the primary and secondary standards once treated at the WTPs. As for turbidity, this parameter is removed through the process trains of Pardee Center, Pardee Recreation Area, and the District's in-line WTPs (Walnut Creek, Lafayette, and Orinda WTPs). The monthly and annual water quality reports prepared for CDHS indicate that all of the District's WTPs that receive Mokelumne River water effectively treat the water, meeting all drinking water standards -- both primary and secondary.

Camanche Reservoir - Evaluation of Water Quality

Camanche Reservoir is predominantly used for flood control and to meet fish flow requirements defined in the District's water rights permit. One small system -- Camanche South Shore WTP -- treats Camanche Reservoir water. The system serves about 250 permanent residents and a seasonal transient population, usually less than 3,000. Therefore, the raw water quality monitoring requirements as defined under Title 22 for Camanche Reservoir are less extensive than those required for Pardee Reservoir. The results of this monitoring along with other pertinent water quality parameters are discussed below. Camanche North Shore WTP treats groundwater.

Existing Raw Water Quality. Table 4-12 provides a statistical summary of the raw water quality of Camanche Reservoir from June 1999 through December 2004. MCLs and DLRs for reporting are documented for each parameter along with minimum, median, and maximum statistics. As noted in Table 4-12, Camanche Reservoir water is fairly neutral in nature with a median pH of 7.2, with a range of 6 to 8. Total alkalinity was low ranging from 12 to 61, with a median of 18 mg/L as $CaCO_3$. The moderate alkalinity of 61 mg/L was a one time high, which is not representative of Camanche water. Total hardness ranged from 9 to 32 mg/L as $CaCO_3$, reflecting very soft water.

Table 4-12: Camanche Reservoir Water Quality Monitoring Statistical Summary 2000-2004

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
Microbiological Consituents							
Cryptosporidium	TT[1]	#/L	NA	NA	NA	NA	NA
E.Coli	TCR[2]	MPN/100mL	250	2	ND	2400	NA
Fecal Coliforms	TCR[2]	MPN/100mL	248	2	ND	3000	NA
Giardia	TT[1]	#/L	NA	NA	NA	NA	NA
Heterotrophic Plate Count	500	cfu/mL	2	104	94	120	NA
Legionella	TT[1]		NA	NA	NA	NA	NA
Total Coliforms	TCR[2]	MPN/100mL	251	17	ND	16000	NA
Turbidity	TT[1]	NTU	1084	1.5	0.29	16.6	NA
Viruses	TT[1]		NA	NA	NA	NA	NA
Primary Standards -- Inorganic Chemicals							
Aluminum (Al)	1000	ug/L	764	32.2	ND	964	50
Antimony (Sb)	6	ug/L	368	ND	ND	7.48	6
Arsenic (As)	50 [5]	ug/L	134	ND	ND	16.6	2
Asbestos	7	mf/l	1	ND	ND	ND	0.2
Barium (Ba)	1000	ug/L	775	18.8	8.04	29	100
Beryllium (Be)	4	ug/L	851	ND	ND	0.667	1
Cadmium (Cd)	5	ug/L	726	ND	ND	0.68	1
Chromium (Cr)	50	ug/L	595	ND	ND	33.6	0.1
Copper (Cu)	TT[1]	ug/L	851	ND	ND	34.8	50
Cyanide (CN)	150	ug/L	NA	NA	NA	NA	100
Fluoride (F-)	2	mg/L	18	0.04	0.02	0.061	0.1
Lead (Pb)	TT[1]	ug/L	317	ND	ND	13.7	5
Mercury (Hg)	2	ug/L	240	0.032	ND	0.7	1

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
Nickel (Ni)	100	ug/L	684	0.399	ND	90.7	10
Nitrate (as N)	10	mg/L	818	ND	ND	0.13	NA
Nitrate (as NO_3)	45	mg/L	NA	NA	NA	NA	2
Nitrite (as N)	1	mg/L	673	ND	ND	0.013	0.4
Selenium (Se)	50	ug/L	151	ND	ND	7.81	5
Nitrate+Nitrite (as N)	10	mg/L	549	ND	ND	0.12	NA
Thallium (Tl)	2	ug/L	334	ND	ND	2.23	1
Primary Standards -- Non-volatile Organic Chemicals (SOCs)							
2,4-D	70	ug/L	NA	NA	NA	NA	10
2,4,5-TP (Silvex)	50	ug/L	NA	NA	NA	NA	1
2,3,7,8-TCDD (Dioxin)	30	pg/L	NA	NA	NA	NA	0.000005
Alachlor (Alanex)	2	ug/L	2	ND	ND	ND	1
Atrazine (Aatrex)	1	ug/L	2	ND	ND	ND	0.5
Bentazon (Basagran)	18	ug/L	NA	NA	NA	NA	2
Benzo(a)pyrene	0.2	ug/L	NA	NA	NA	NA	10
Di(2-ethylhexyl)adipate	400	ug/L	NA	NA	NA	NA	5
Di(2-ethylhexyl)phthalate	4	ug/L	NA	NA	NA	NA	3
Carbofuran	18	ug/L	NA	NA	NA	NA	5
Chlordane	0.1	ug/L	NA	NA	NA	NA	0.1
Dalapon	200	ug/L	NA	NA	NA	NA	10
Polychlorinated Biphenyls (PCB's)	0.5	ug/L	NA	NA	NA	NA	0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	4	ND	ND	ND	NA
Dinoseb (DNBP)	7	ug/L	NA	NA	NA	NA	2
Diquat	20	ug/L	NA	NA	NA	NA	4
Endothall	100	ug/L	NA	NA	NA	NA	45
Endrin	2	ug/L	NA	NA	NA	NA	0.1
Ethylene Dibromide (EDB)	0.05	ug/L	4	ND	ND	ND	0.02
Lindane	0.2	ug/L	NA	NA	NA	NA	0.2
Glyphosate	700	ug/L	NA	NA	NA	NA	25
Heptachlor	0.01	ug/L	NA	NA	NA	NA	0.01
Heptachlor Epoxide	0.01	ug/L	NA	NA	NA	NA	0.01
Hexachlorobenzene	1	ug/L	NA	NA	NA	NA	0.5
Hexachlorocyclopentadiene	50	ug/L	NA	NA	NA	NA	1
Methoxychlor	30	ug/L	NA	NA	NA	NA	10
Molinate	20	ug/L	1	ND	ND	ND	2
Oxamyl (Vydate)	50	ug/L	NA	NA	NA	NA	20
Pentachlorophenol (PCP)	1	ug/L	NA	NA	NA	NA	0.2
Picloram	500	ug/L	NA	NA	NA	NA	1
Simazine	4	ug/L	1	ND	ND	ND	1
Thiobencarb	70	ug/L	2	ND	ND	ND	1
Toxaphene	3	ug/L	NA	NA	NA	NA	1
Primary Standards -- Radioactivity							
Gross Alpha	15	pCi/L	4	---	0	2.74	3
Gross Beta	50	pCi/L	1	---	0	2.62	4

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
Radium 226 + Radium 228, combined	5	pCi/L	NA	NA	NA	NA	NA
Strontium	8	pCi/L	NA	NA	NA	NA	2
Tritium	20000	pCi/L	NA	NA	NA	NA	1000
Uranium	20	pCi/L	4	---	0	1.557	1
Disinfectant/Disinfection Byproducts Rule							
Chlorine as Cl_2	4	mg/L	NA	NA	NA	NA	NA
Chloramines as Cl_2	4	mg/L	NA	NA	NA	NA	NA
Chlorine Dioxide	0.8	mg/L	NA	NA	NA	NA	NA
Dichlorobromomethane		ug/L	446	ND	ND	3.1	0.5
Bromoform		ug/L	447	ND	ND	ND	0.5
Chloroform		ug/L	445	ND	ND	29	0.5
Dibromochloromethane		ug/L	447	ND	ND	0.22	0.5
Total Trihalomethanes	80	ug/L	---	ND	ND	32	NA
HAA5	60	ug/L	NA	NA	NA	NA	NA
Bromate	10	ug/L	NA	NA	NA	NA	0.005
Chlorite	1	mg/L	NA	NA	NA	NA	0.02
Primary Standards -- Volatile Organic Chemicals (VOCs)							
1,1,1-Trichloroethane (1,1,1-TCA)	200	ug/L	438	ND	ND	ND	0.5
1,1,2,2-Tetrachloroethane	1	ug/L	445	ND	ND	ND	0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	1200	ug/L	428	ND	ND	ND	10
1,1,2-Trichloroethane (1,1,2-TCA)	5	ug/L	445	ND	ND	ND	0.5
1,1-Dichloroethane (1,1-DCA)	5	ug/L	445	ND	ND	ND	0.5
1,1-Dichloroethylene (1,1-DCE)	6	ug/L	446	ND	ND	ND	0.5
1,2,4-Trichlorobenzene	5	ug/L	447	ND	ND	ND	0.5
1,2-Dichlorobenzene (o-DCB)	600	ug/L	447	ND	ND	ND	0.5
1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	443	ND	ND	ND	0.5
1,2-Dichloropropane	5	ug/L	444	ND	ND	ND	0.5
1,3-Dichloropropene (total)	0.5	ug/L	443	ND	ND	ND	0.5
1,4-Dichlorobenzene (p-DCB)	5	ug/L	447	ND	ND	ND	0.5
Benzene	1	ug/L	447	ND	ND	0.36	0.5
Carbon Tetrachloride	0.5	ug/L	439	ND	ND	ND	0.5
cis-1,2-Dichlorethylene (c-1,2-DCE)	6	ug/L	446	ND	ND	ND	0.5
cis-1,3-Dichloropropene	0.5	ug/L	446	ND	ND	ND	0.5
Ethylbenzene	300	ug/L	442	ND	ND	0.28	0.5
Trichlorofluoromethane (Freon 11)	150	ug/L	436	ND	ND	0.16	5
Dichloromethane (Methylene Chloride)	5	ug/L	447	ND	ND	1.2	NA
Methyl-tert-butyl ether (MTBE)	13	ug/L	429	0.44	ND	8.4	3

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
Monochlorobenzene (Chlorobenzene)	70	ug/L	447	ND	ND	ND	0.5
Styrene	100	ug/L	443	ND	ND	ND	0.5
Tetrachloroethylene	5	ug/L	442	ND	ND	ND	0.5
Toluene	150	ug/L	447	ND	ND	7.8	0.5
trans-1,2-Dichloroethylene (t-1,2-DCE)	10	ug/L	447	ND	ND	ND	0.5
trans-1,3 Dichloropropene	0.5	ug/L	445	ND	ND	ND	0.5
Trichloroethylene (TCE)	5	ug/L	447	ND	ND	ND	0.5
Vinyl Chloride (VC)	0.5	ug/L	436	ND	ND	ND	0.5
Xylenes (total)	1750	ug/L	443	ND	ND	1.7	NA
Lead and Copper Rule (Action Levels)							
Copper (Cu)	1300	ug/L	851	ND	ND	34.8	50
Lead (Pb)	15	ug/L	317	ND	ND	13.7	5
Secondary Standards							
Aluminum (Al)	200	ug/L	764	32.2	ND	964	50
Chloride (Cl)	600	mg/L	36	1.5	1	300	NA
Color	15	color unit	1	8	8	8	NA
Specific Conductance	2200	u-omhs	140	47	33	52	NA
Copper (Cu)	1000	ug/L	851	ND	ND	34.8	50
Iron (Fe)	300	ug/L	728	49	ND	774	100
Manganese (Mn)	50	ug/L	826	8.74	1.11	260	NA
Foaming Agents (MBAS)	0.5	mg/L	1	ND	ND	ND	NA
Methyl-tert-butyl ether (MTBE)	5	ug/L	429	0.44	ND	8.4	3
pH	6.5-8.5	pH units	1	7.3	7.3	7.3	NA
Silver (Ag)	100	ug/L	696	ND	ND	10.9	10
Sulfate	600	mg/L	903	1.9	ND	24	0.5
Thiobencarb	1	ug/L	2	ND	ND	ND	1
Odor--Threshold	3	TON	1	35	35	35	1
Total Dissolved Solids	1500	mg/L	36	38	22	690	NA
Turbidity	5	NTU	140	0.86	0.29	5.8	0.1
Zinc (Zn)	5000	ug/L	655	6.94	ND	82.6	50
CDHS Drinking Water Notification Levels							
1,2,3-Trichloropropane	0.005	ug/L	NA	NA	NA	NA	0.005
1,2,4-Trimethylbenzene	330	ug/L	435	ND	ND	0.29	0.5
1,3,5-Trimethylbenzene	330	ug/L	438	ND	ND	ND	0.5
1,4-Dioxane	3	ug/L	NA	NA	NA	NA	3
Methyl isobutyl ketone (MIBK)	120	ug/L	446	ND	ND	ND	5
Boron	1000	ug/L	591	8.45	ND	23	100
Carbon Disulfide	160	ug/L	418	ND	ND	31	0.5
Chlorate	800	ug/L	NA	NA	NA	NA	20
Dichlorodifluoromethane	1000	ug/L	420	ND	ND	ND	0.5
Ethylene Glycol (anti-freeze)	14	mg/L	NA	NA	NA	NA	NA
Formaldehyde	100	ug/L	NA	NA	NA	NA	NA
Isopropylbenzene	770	ug/L	439	ND	ND	ND	0.5

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
Manganese (Mn)	500	ug/L	826	8.74	1.11	260	20
Naphthalene	17	ug/L	447	ND	ND	0.16	0.5
N-Butylbenzene	260	ug/L	446	ND	ND	ND	0.5
N-Nitrosodiethylamine	210	ng/L	NA	NA	NA	NA	0.002
N-Nitrosodimethylamine (NDMA)	10	ng/L	NA	NA	NA	NA	0.002
Propylbenzene (n)	260	ug/L	NA	NA	NA	NA	NA
2-Chlorotoluene	140	ug/L	439	ND	ND	ND	0.5
4-Chlorotoluene	140	ug/L	440	ND	ND	ND	0.5
Perchlorate	6	ug/L	NA	NA	NA	NA	4
sec-Butylbenzene	260	ug/L	435	ND	ND	ND	0.5
Tertiary-butyl alcohol	12	ug/L	178	ND	ND	ND	2
tert-Butylbenzene	260	ug/L	435	ND	ND	ND	0.5
Vanadium	50	ug/L	355	0.507	ND	3.52	3
CDHS Archived Advisory Levels							
Aldicarb	7	ug/L	NA	NA	NA	NA	3
Aldrin	0.000002	mg/L	NA	NA	NA	NA	0.075
Baygon	30	ug/L	NA	NA	NA	NA	NA
a-Benzene Hexachloride	0.000015	mg/L	NA	NA	NA	NA	NA
b-Benzene Hexachloride	0.025	ug/L	NA	NA	NA	NA	NA
Captan	0.0015	mg/L	NA	NA	NA	NA	0.1
Carbaryl	700	ug/L	NA	NA	NA	NA	5
Chloropicrin	0.056	mg/L	NA	NA	NA	NA	1
Chlorpropham (CIPC)	1.2	mg/L	NA	NA	NA	NA	NA
Diazinon	6	ug/L	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	600	ug/L	439	ND	ND	ND	0.5
Dieldrin	0.000002	mg/L	NA	NA	NA	NA	0.00002
Dimethoate	1	ug/L	NA	NA	NA	NA	NA
2,4-Dimethylphenol	0.1	mg/L	NA	NA	NA	NA	0.005
Diphenamide	0.2	mg/L	NA	NA	NA	NA	0.1
Ethion	0.004	mg/L	NA	NA	NA	NA	NA
Malathion	0.16	mg/L	NA	NA	NA	NA	NA
N-Methyl dithiocarbamate (Metam sodium)	0.02	mg/L	NA	NA	NA	NA	NA
Methylisothiocyanate	0.05	mg/L	NA	NA	NA	NA	NA
Methyl parathion	2	ug/L	NA	NA	NA	NA	NA
Parathion	0.04	mg/L	NA	NA	NA	NA	0.02
Pentachloronitrobenzene	0.02	mg/L	NA	NA	NA	NA	NA
Phenol	4.2	mg/L	NA	NA	NA	NA	0.005
2,3,5,6-Tetrachloroterephthalate	3500	ug/L	NA	NA	NA	NA	NA
Trithion	0.007	mg/L	NA	NA	NA	NA	NA
Unregulated Contaminant -- List 1							
2,4-dinitrotoluene		ug/L	NA	NA	NA	NA	5
2,6-dinitrotoluene		ug/L	NA	NA	NA	NA	5
4,4'-DDE		ug/L	NA	NA	NA	NA	0.01
Acetochlor		ug/L	NA	NA	NA	NA	NA

Water Quality Parameters	MCL	Units	Number of Samples	Median	Minimum	Maximum	DLR
DCPA, Total mono & di acid*		ug/L	NA	NA	NA	NA	NA
EPTC		ug/L	2	ND	ND	ND	NA
Nitrobenzene		ug/L	415	ND	ND	ND	5
Terbacil		ug/L	2	ND	ND	ND	NA
Other Parameters							
Alkalinity (HCO_3)		mg/L	1	17	17	17	NA
Alkalinity (CO_3)		mg/L	1	ND	ND	ND	NA
Hydroxide Alkalinity		mg/L	1	ND	ND	ND	NA
Total Alkalinity (As $CaCO_3$)		mg/L	815	18	12	61	NA
Total Hardness		mg/L	853	17	9	32	NA
Calcium (Ca)		ug/L	604	4185	3070	6740	NA
Magnesium (Mg)		ug/L	533	1370	853	1910	NA
Orthophosphate (as P)		mg/L	482	ND	ND	0.033	NA
Silica		ug/L	405	3670	752	5940	NA
Sodium (Na)		ug/L	770	2475	1370	4030	NA
Total Organic Carbon		mg/L	NA	NA	NA	NA	0.3
Total Phosphate (as P)		mg/L	454	0.021	0.007	0.078	NA
Chromium VI		ug/L	NA	NA	NA	NA	1
Ethyl-tert-butyl-ether		ug/L	457	ND	ND	ND	3
tert-Amyl-methyl ether		ug/L	440	ND	ND	0.11	3
Bromide		mg/L	16	ND	ND	0.1	NA

[1]Treatment Technique (TT)
- *Cryptosporidium* (as of 1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- *Giardia lambia*: 99.9% removal/inactivation
- Viruses: 99.99% removal/inactivation
- *Legionella*: No limit, but USEPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelolometric turbidity units (NTU) ; systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, for systems servicing >10,000, and January 14, 2005, for systems servicing <10,000, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.
- Lead and Copper: if more than 10% of tap water samples exceed the action levels, water systems must take additional steps.

[2]No more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli*. If two consecutive TC-positive samples, and one is also positive for *E. Coli* or fecal coliforms, the system has an acute MCL violation.

[3]NA = Data Not Available

[4]ND = Not Detected (i.e. value is below detection limit).

[5]Arsenic MCL = 50 ug/L at the time of sampling. After January 2006, the Arsenic MCL is 10 ug/L.

Turbidity. Figure 4-17 depicts the monthly turbidity from June 1999 December 2004 at Camanche Reservoir. While the maximum turbidity was 16.6 NTU, the median value was 1.5 NTU during this five-year period. In addition, 96 percent of the turbidity data were below 5 NTU, as shown in Figure 4-18. One of the highest turbidity events occurred in the winter of 2000, when elevated turbidity was also observed in the Mokelumne River and Pardee Reservoir water.

Figure 4-17: Camanche Reservoir Turbidity Monitoring

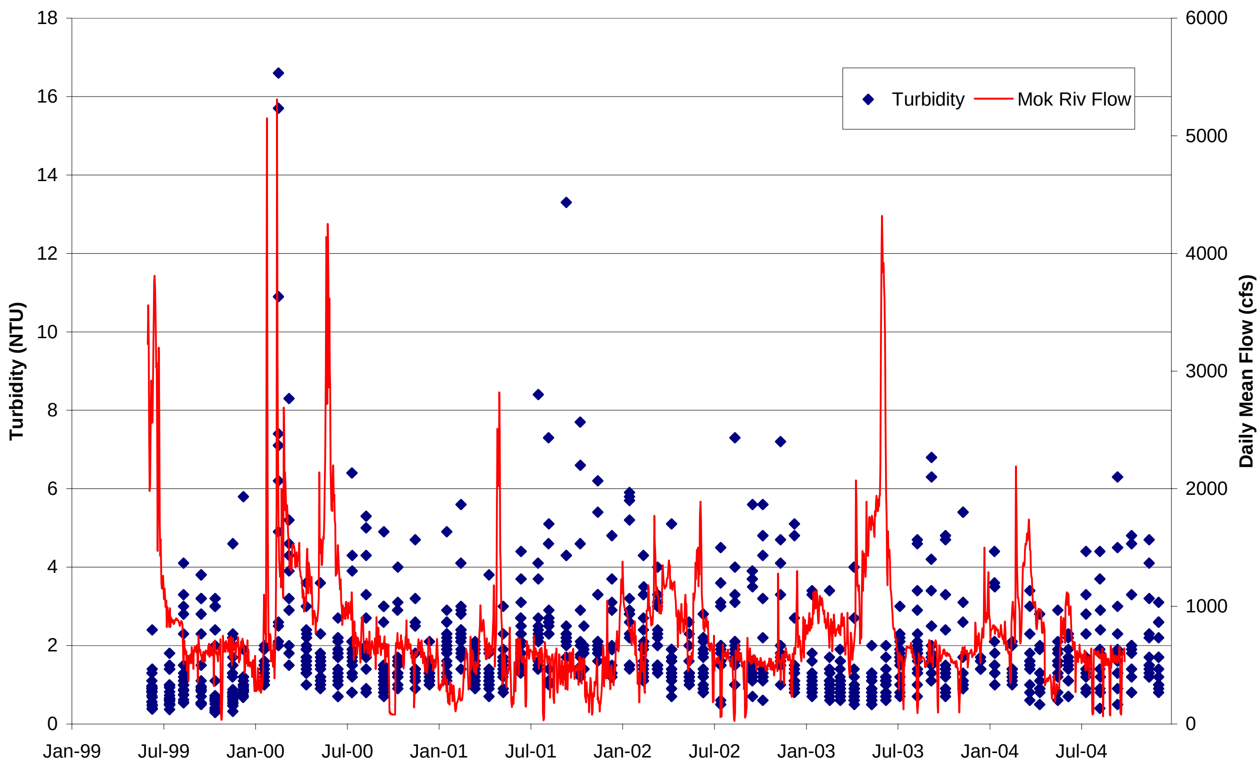
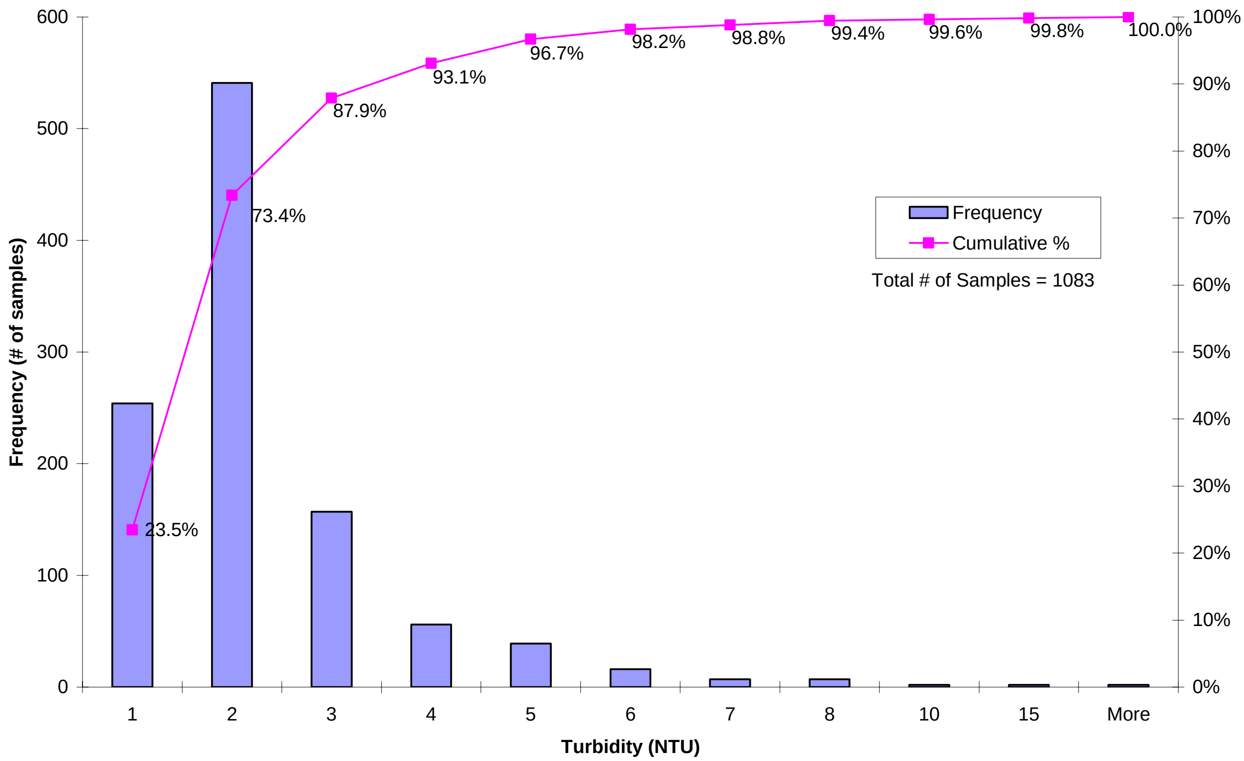


Figure 4-18: Frequency and Cumulative Distribution of Turbidity at Camanche



Microbiological. Given that Camanche Reservoir is predominantly used for flood control and fish flows and secondarily as a source for one small system, monitoring for *Giardia* and *Cryptosporidium* has yet to be conducted at Camanche. The District monitors total coliforms, fecal coliforms, *E. coli*, and turbidity at Camanche South Shore WTP.

Figure 4-19 highlights the raw water total coliform count versus time for 1999 through 2004. Samples collected directly from the surface of the reservoir and at the influent to Camanche South Shore WTP. While the influent to Camanche South Shore WTP is monitored year round, Camanche Reservoir is only sampled during the summer months due to higher visitor and recreational use. The frequency and cumulative distribution for this data set is presented in Figure 4-20. As Figure 4-20 depicts, Camanche Reservoir is of good quality with total coliform counts below 1,000 MPN/100 mL, 95 percent of the time. The median total coliform count was 17 MPN/100 mL with a range of non-detect to 16,000 MPN/100 mL.

Figure 4-19: Camanche Reservoir Total Coliform Monitoring

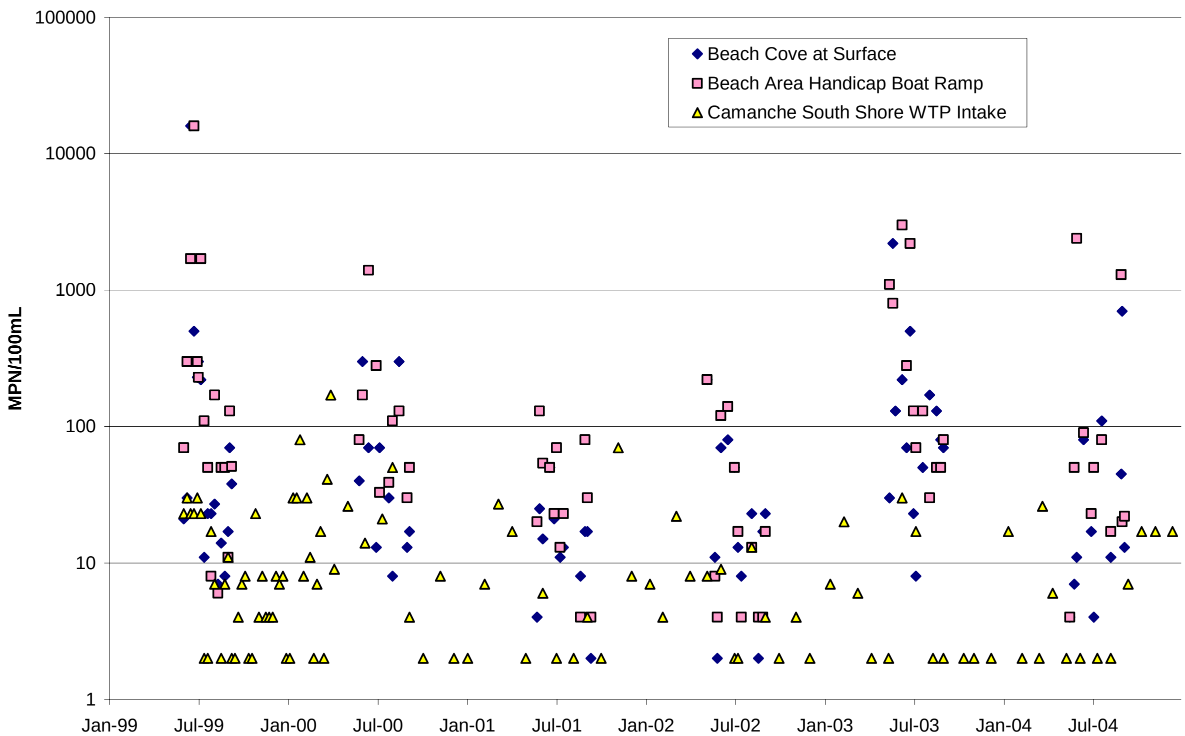
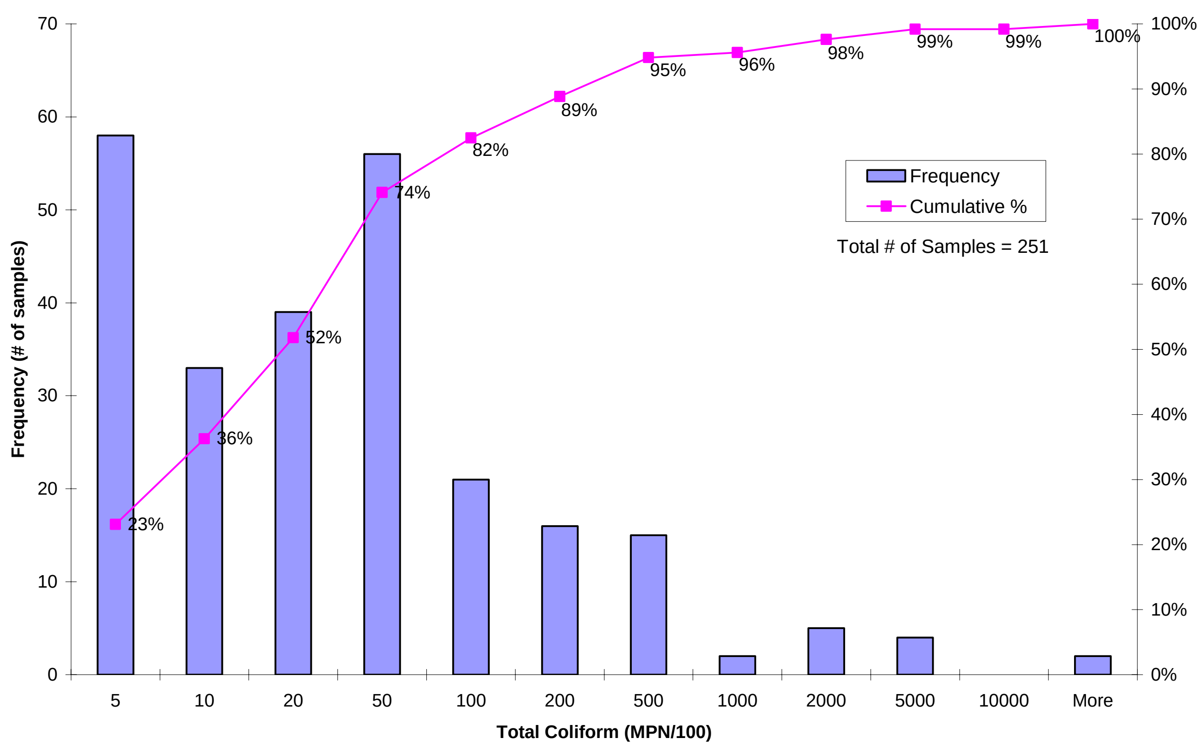
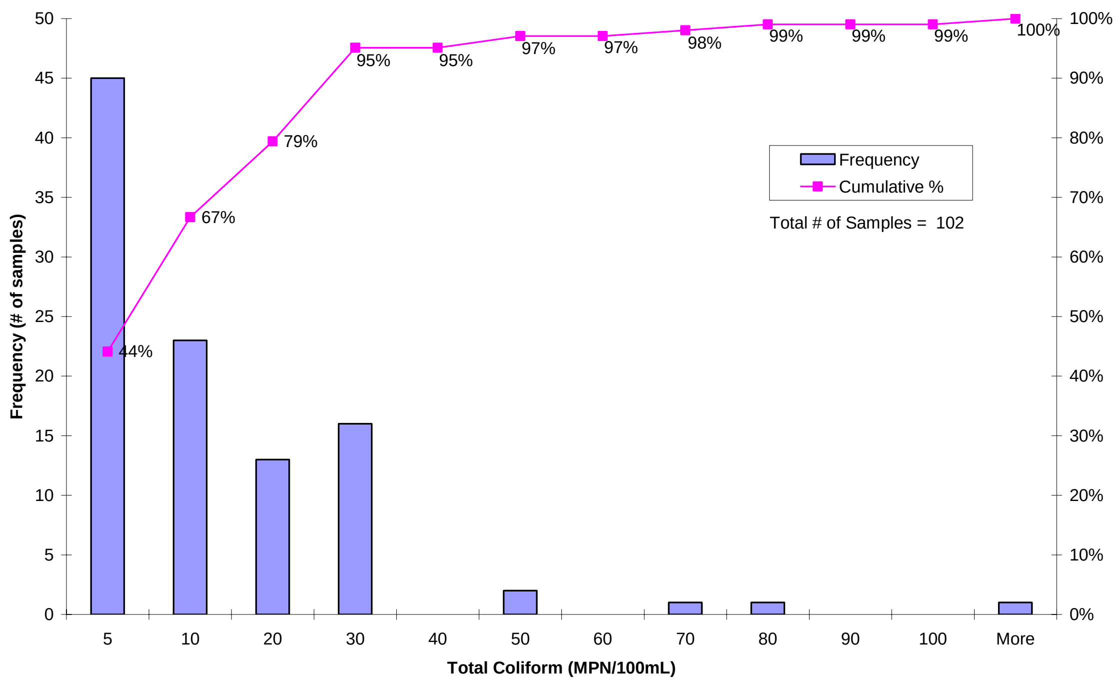


Figure 4-20: Frequency and Cumulative Distribution of Total Coliform at Camanche Reservoir



It should be noted that Camanche South Shore WTP influent has much lower total coliform count than levels measured in the reservoir, due to its protected intake location. Figure 4-21 shows the influent total coliform count of no more than 30 MPN/100mL, 95 percent of the time, with a maximum value of 170 MPN/100mL (Figure 4-19).

Figure 4-21: Frequency and Cumulative Distribution of Total Coliform at Camanche South Shore WTP



Figures 4-22 and 4-23 depict fecal coliform and *E. coli* monitoring at Camanche Reservoir, respectively. These two figures further support the total coliform results depicted in Figure 4-19 – the surface reservoir samples are much higher than the WTP's raw water intake, which is 30 feet below the surface. Low fecal coliform and *E. coli* counts were detected during the five-year monitoring program, with median counts of non-detect for both parameters and maximum values of 3,000 and 2,400 MPN/100 mL, respectively. The maximum levels of fecal coliform and *E. coli* at Camanche South Shore intake are 13 and 8 MPN/100mL.

Figure 4-22: Camanche Reservoir Fecal Coliform Monitoring

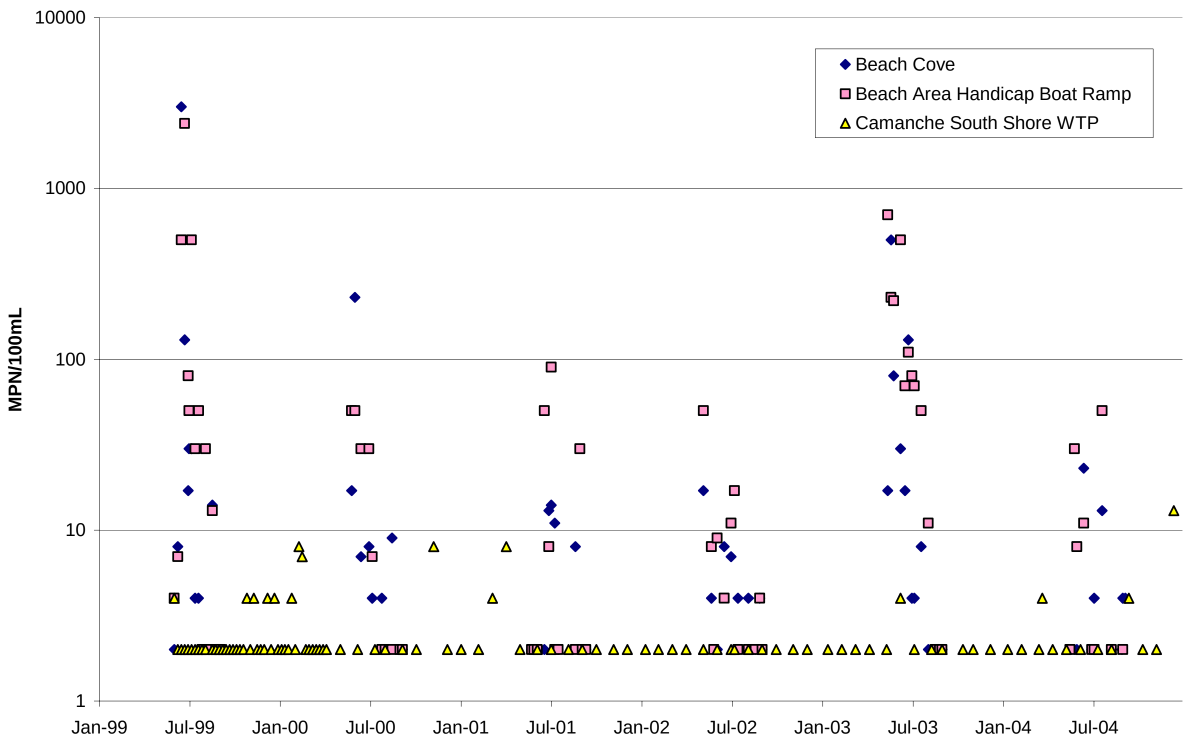
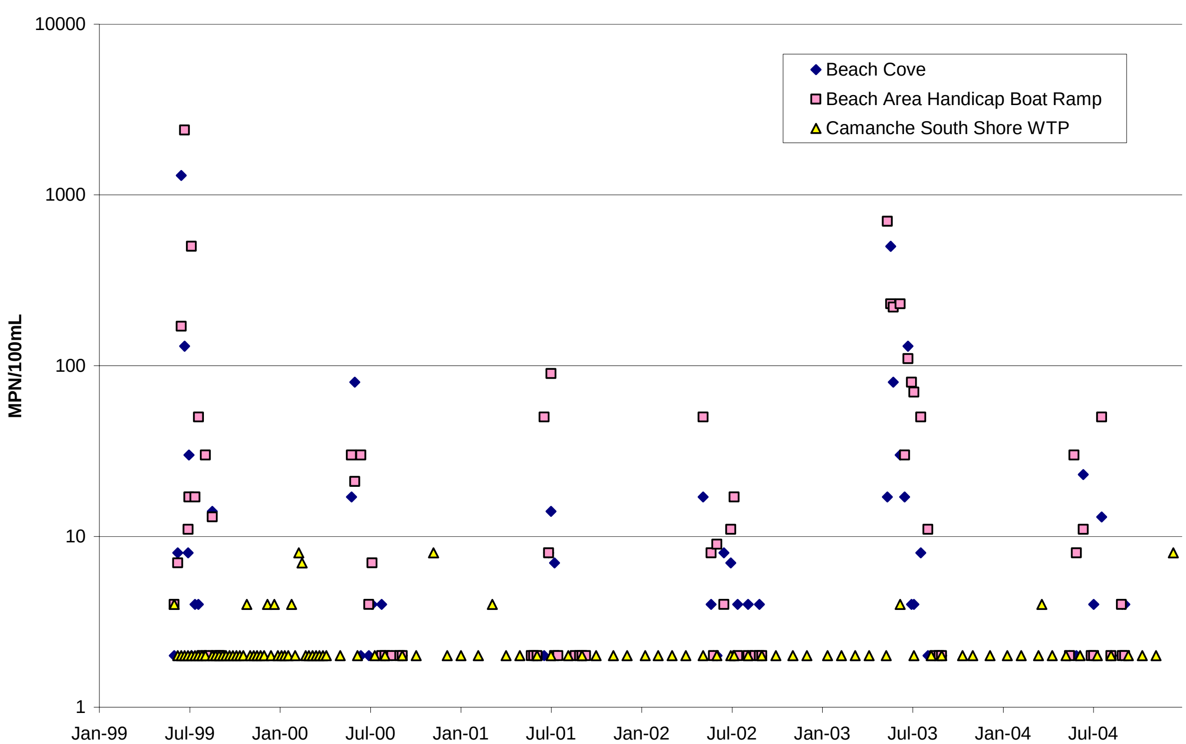


Figure 4-23: Camanche Reservoir E.Coli Monitoring



General Minerals and Inorganic Chemicals. The general minerals and inorganic chemicals present in Camanche Reservoir were detected at very low to moderate concentrations with the exception of antimony and thallium. As highlighted previously and summarized in Table 4-12, the median concentrations for total alkalinity and total dissolved solids were very low at 18 mg/L as $CaCO_3$ and 38 mg/L, respectively.

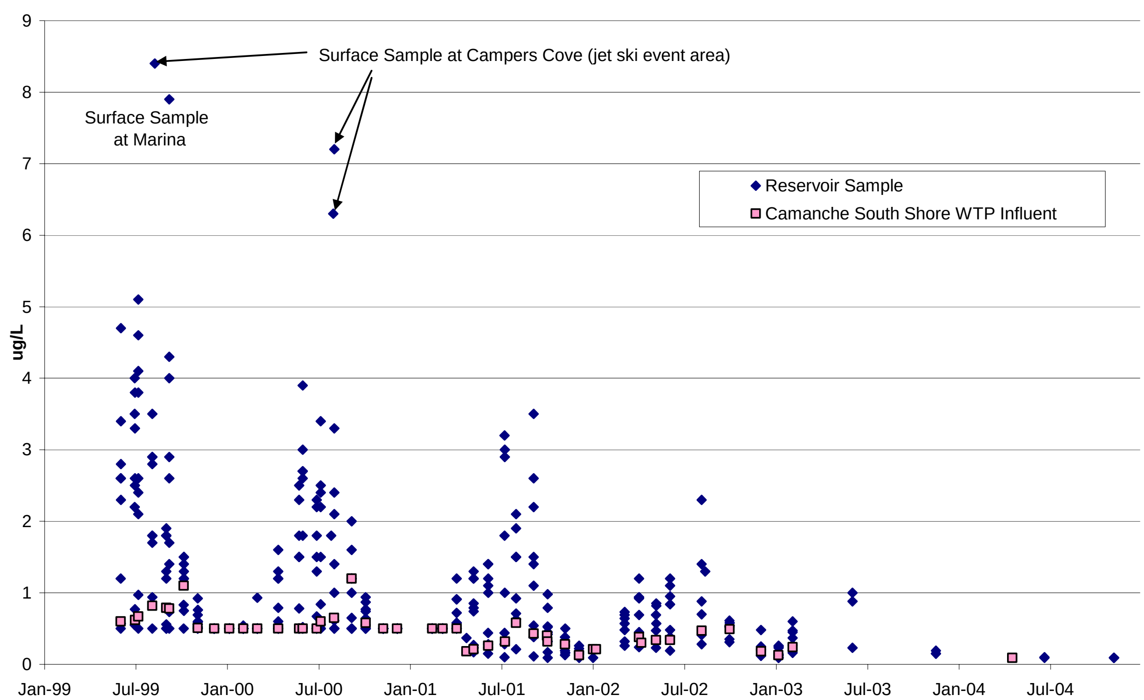
For the past five years, the median concentrations for general minerals and inorganic chemicals in Camanche Reservoir have been non-detect or below the USEPA and CDHS primary and secondary drinking water MCLs. The median values for both antimony and thallium were non-detect, even though the maximum values exceeded MCLs. Aluminum was detected at a maximum concentration of 0.96 mg/L with a median value of 0.032 mg/L. Similarly, while the maximum level detected – 0.77 mg/L -- was above this MCL, the median raw water concentrations for iron was below the treated water secondary MCL of 0.3 mg/L. The source for these contaminants may be attributable to runoff from the Penn Mine area.

Arsenic monitoring in Camanche Reservoir from the same period reflects a median concentration of non-detect and a maximum value of 16.6 µg/L. Although the maximum arsenic reading is above the new 2006 regulation, it was the only reading out of 134 samples above 10 ug/L. Treatment at Camanche South Shore WTP should remove the soluble fraction of arsenic.

Regulated Organic Chemicals. As Table 4-12 indicates, the maximum concentrations of all the regulated VOCs were non-detect with the exception of benzene, ethylbenzene, freon 11, methylene chloride, MTBE, toluene, and total xylenes. While detectable, the maximum raw water concentrations for these contaminants were well below the primary drinking water MCLs. For the regulated SOCs monitored during this five-year period, all maximum concentrations were non-detect. CDHS approved a monitoring waiver for the regulated non-volatile SOCs, with the exception of atrazine and simazine. These results indicate that Camanche Reservoir water is of high quality.

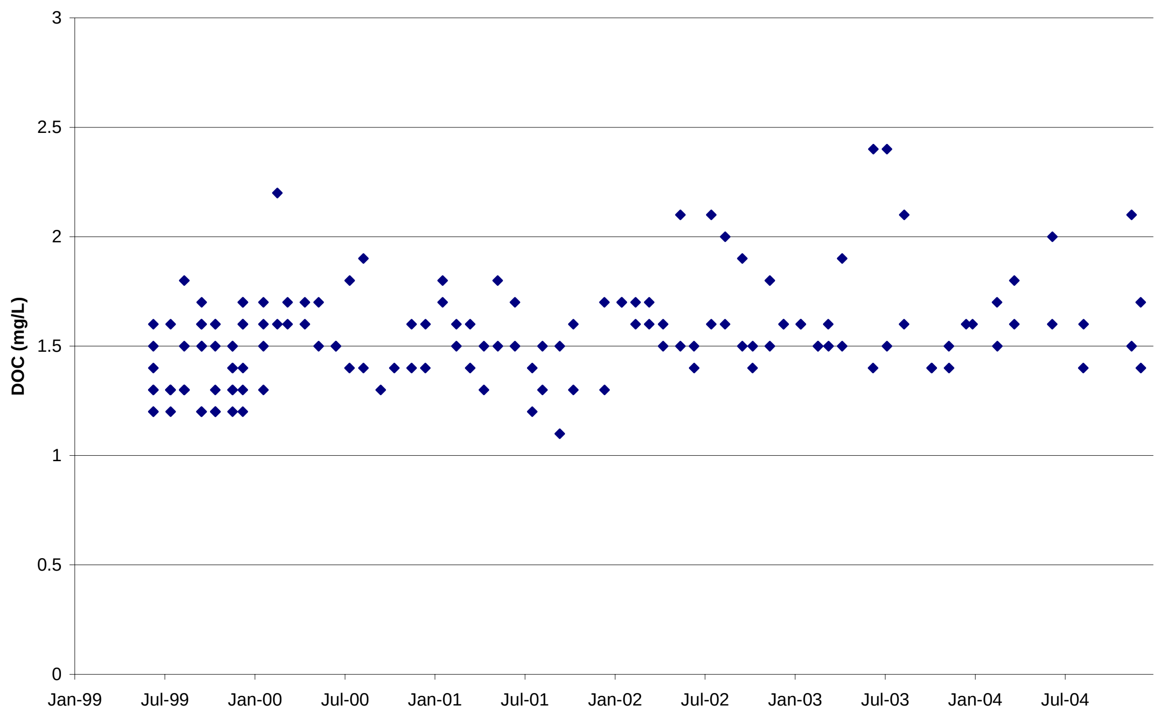
Based on monitoring initiated in 1998, the District has frequently detected MTBE in Camanche Reservoir. Figure 4-24 depicts the results of this MTBE sampling program with a maximum concentration of 8.4 µg/L and a median concentration 0.44 µg/L. Samples that exceeded secondary standard of 5 ug/L came from surface samples at the marina and Campers Cove, where seasonal jetski events take place. Figure 4-24 also shows a decline in MTBE concentrations in the reservoir. It should be noted that because Camanche South Shore WTP intake is located in a protected area, the influent MTBE reading are much lower than the reservoir samples.

Figure 4-24: Camanche Reservoir MTBE Monitoring



Total Organic Carbon. TOC was not monitored during the past five years, however DOC was sampled on a regular basis. As shown in Figure 4-25, DOC observed in Camanche Reservoir has a narrow range from 1.1 to 2.4, with a median value of 1.5 mg/L.

Figure 4-25: Camanche Reservoir DOC Monitoring



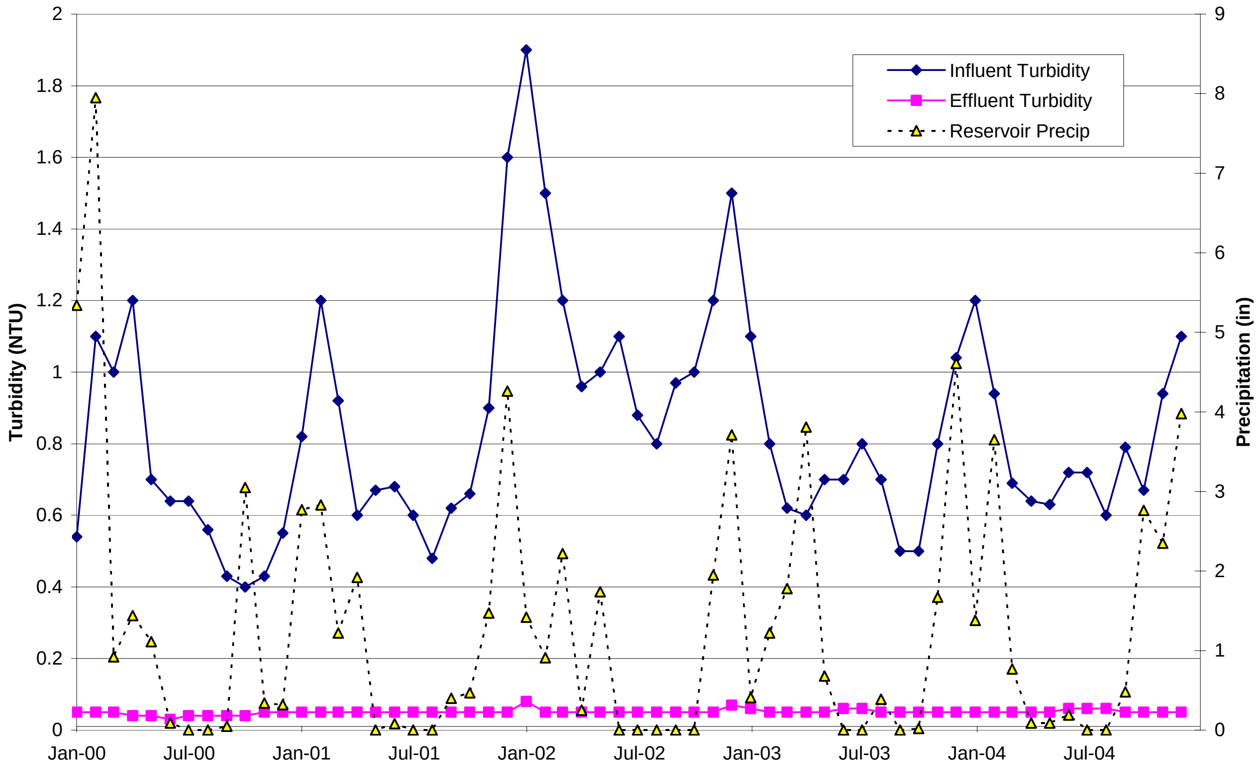
Taste & Odor (T&O). During the past five years, there have been no T&O complaints associated with Camanche Reservoir, therefore, T&O related sampling was not included in the Camanche monitoring program. However, during the past five years, odor was recorded once at Camanche South Shore WTP raw water intake, with a reading of 35 TON. Given that only one data point exists, it was not possible to find an explanation. A possible explanation for such a high value is that this sample, which is a result of algae bloom, was in fact taken in April. TON analysis was conducted at 35°C, which is a much higher than typical consumer use.

While specific T&O related monitoring was not conducted at Camanche Reservoir, the District collected algal data as part of the water quality-sampling program to support reservoir operations. Table 4-10 summarizes the results of this sampling by documenting algal species detected at concentrations greater than 1,000 colonies or cells per 100 mL. Similar to Pardee Reservoir, a number of algal species prevalent in Camanche Reservoir at concentrations greater than 1,000 colonies or cells per 100 mL can cause T&O and filtration problems. Fortunately, none of these events impacted the performance of the Camanche South Shore WTP.

Radioactivity. As shown in Table 4-12, the maximum values of the measured radioactivity parameters are well below the MCLs.

Trends in Water Quality. The relationship between watershed conditions and water quality may be extracted from current water quality monitoring programs, monthly precipitation and turbidity are plotted in Figure 4-26. As shown in this figure, a correlation is suggested between rainfall events and elevated turbidity for the Camanche Reservoir. However, the treated water turbidities at Camanche South Shore WTP indicate that relatively consistently low turbidity is produced whether or not there is a raw water turbidity spike caused by a rainfall event.

Figure 4-26: Camanche South Shore WTP Raw and Treated Turbidity and Camanche Reservoir Precipitation



In addition to turbidity, the total coliform, fecal coliform, and *E. coli* data discussed previously suggest a direct correlation between maximum raw water microbiological counts and highest annual recreational use of Camanche Reservoir. Also, monitoring of MTBE has enabled the District to identify a direct correlation between elevated concentrations and increased motorboat and personal watercraft activities. This resulted in the District developing a proactive watershed management approach, which helped mitigate raw water MTBE concentrations. These microbiological and MTBE trends emphasize the importance of understanding the relationships between watershed activities and water quality whenever possible. In turn, watershed management practices can be modified if deemed necessary.

Comparison of Raw/Treated Water to Standards. Water treatment plant monthly water quality and annual inspection reports prepared for CDHS were used to evaluate the treated or finished water for the Camanche South Shore WTP.

Raw water in the Camanche Reservoir generally met treated water quality standards, with the exception of parameters: antimony, thallium, aluminum, iron, manganese, and turbidity. For antimony and thallium, while the maximum values exceeded MCLs, the median values were non-detect. For aluminum, iron, and manganese, the median raw water concentrations were below their respective secondary MCL but the maximum concentrations were well above their respective secondary MCL. These results suggest occasional but infrequent elevated levels occur. None of these parameters occur at concentrations above the primary and secondary standards once treated.

Turbidity is removed through the treatment process train at the Camanche South Shore WTP. The monthly and annual CCRs (available in Appendix B) prepared for CDHS indicate Camanche South Shore WTP effectively treats Camanche Reservoir water, meeting all drinking water standards -- both primary and secondary.

Evaluation of EBMUD Compliance with the SWTR and LT1ESWTR

This section is intended to be an update of the evaluation contained in the 2000 MRWSS. At the time the 1995 MRWSS was prepared, USEPA had targeted microbial contaminants in the SWTR. In Chapter 17 of Title 22 of the California Code of Regulations, CDHS further interpreted the federal rule, and established specific requirements for removal or inactivation of viruses, *Giardia lamblia*, heterotrophic plate count (HPC) bacteria, *Legionellae*, and turbidity. With the recent promulgation of the LT1ESWTR, inactivation requirements have been defined for *Cryptosporidium* and further removals for turbidity for small water systems previously defined for large systems in the IESWTR. The District has been meeting these new treatment requirements.

Regulatory Requirements

A multibarrier treatment must be provided for approved surface waters and reliably achieve the following regulatory requirements:

SWTR

- A total of 99.9 percent (three log) reduction of *Giardia* cysts through filtration and disinfection,
- A total of 99.99 percent (four log) reduction of viruses through filtration and disinfection
- The turbidity of a system's combined filtered waters at a WTP must be less than or equal to 0.5 NTU, 95 percent of the time each month, and
- The turbidity of a system's combined filtered waters at a WTP must at no time exceed 1 NTU.

IESWTR and LT1ESWTR

- A total of 99 percent (two log) reduction of *Cryptosporidium* through filtration,
- The turbidity of a system's combined filtered waters at a WTP must be less than or equal to 0.3 NTU, 95 percent of the time each month, and
- The turbidity of a system's combined filtered waters at a WTP must at no time exceed 1 NTU.

The performance standards, monitoring requirements, and operating criteria detailed in Chapter 17 of Title 22 of the California Code of Regulations are summarized in Table 4-13 and remain relatively unchanged since the 1995 MRWSS.

Table 4-13: IESWTR Compliance Summary - Performance, Monitoring, and Operations

Performance Standards
• The turbidity of filtered water shall be less than or equal to 0.5 NTU in 95 percent of the samples analyzed each month. • Turbidity of filtered water shall not exceed 1.0 NTU at any time. • For grab sampling, turbidity levels of the filtered water shall not exceed 1.0 NTU in more than two consecutive samples while the plant is in operation. • For continuous sampling, turbidity levels of the filtered water shall not exceed 1.0 NTU for more than eight consecutive hours while the plant is in operation. • Water delivered to the distribution system shall not contain a disinfectant residual of less than 0.2 mg/L for more than four hours in any 24-hour period. • The residual disinfectant concentrations of samples collected from the distribution system shall be detectable in at least 95 percent of the samples taken each month. • At any point in the distribution system, the presence of HPC bacteria at less than or equal to 500 cfu/ml shall be considered equivalent to a detectable disinfectant residual.
Monitoring Requirements
• Raw waters of approved surface water sources shall be monitored for daily turbidity grab samples. • The combined filter effluent shall be monitored for turbidity levels at least once every four hours that the system is in operation to determine compliance with performance standards. • Continuous turbidity measurements may be substituted for grab sampling, provided the accuracy of the measurements is verified on a weekly basis. • A monitoring program shall be developed and conducted to measure the parameters affecting the performance of the disinfection process: 1) temperature of the disinfected water 2) pH of the disinfected water if chlorine is used as a disinfectant 3) disinfectant contact time 4) residual disinfectant concentration before or at the first customer. Monitoring program shall be in the operations plan. • Disinfectant residual concentration of the water being delivered to the distribution system shall be monitored and recorded continuously. • The residual disinfectant concentration must be measured at least at the same points in the distribution system and at the same time the total coliforms are sampled.

Operation
• Treatment plant operators shall be certified in accordance with applicable Health and Safety Codes. • Conventional and direct filtration plants shall be operated at flow rates not to exceed: 1) 3.0 gpm/sq. ft. for single media filters, and 2) 6.0 gpm/sq. ft. for deep bed, dual, or mixed media filters under gravity flow conditions. • Filtration rates shall be increased gradually when placing filters back into service following any interruption in operation of the filter. • When an individual filter is placed back in service, the filtered water turbidity of the effluent shall not exceed: 1) 2.0 NTU 2) 1.0 NTU in at least 90 percent of the interruption events during any consecutive 12-month period. 3) 0.5 NTU after the filter has been in operation for 4 hours. • Coagulation and flocculation unit processes shall be in use at all times during which conventional and direct filtration plants are in operation. • The effectiveness of coagulation and flocculation unit processes shall be demonstrated by at least an 80 percent reduction through the filters of the monthly average raw water turbidity. • The filtered water turbidity shall be monitored with a continuous turbidity meter and recorder, or with an approved grab sampling program. • If a filter unit is not meeting the operating criteria, the filter shall be taken out of service, deficiencies corrected, and its operations tested to demonstrate that it is meeting the criteria. • Disinfection facilities shall maintain a reserve supply of chemical necessary to provide continuous operation of disinfection facilities. • Disinfection facilities shall develop an emergency plant for implementation in the event of a disinfection failure. Delivery of undisinfected or inadequately disinfected water to the distribution system shall be prevented. • Operations plan shall include: 1) performance monitoring program 2) unit process equipment maintenance program 3) operating personnel, including number of staff, certification level, and responsibilities 4) how and when each unit process is operated 5) laboratory procedures 6) procedures used to determine chemical dose rates 7) records 8) response to plant and watershed emergencies 9) reliability features.

Records
• Operations records shall include: 1) all monitoring results. 2) dates on which filter maintenance and inspection were performed and the results of any inspections. 3) quantity of water produced, plant flow rates, filtration rates, hours of operation, and backwash rates. 4) dates and descriptions of major equipment and process failures, and corrective actions taken. • Treatment plant records shall be retained for not less than two years.

Source: California Code of Regulations, Title 22, Chapter 17.

EBMUD Compliance with SWTR and IESWTR

Water quality monitoring and operation of the water treatment processes at each of the District's WTPs is conducted in accordance with the respective Water Supply Permits. The District's SWTR Operations Plan 2005 contains the current operational criteria for compliance with the SWTR for the Walnut Creek, Lafayette, and Orinda WTPs. Operational criteria for the Pardee Center, Pardee Recreation Area, Camanche North Shore Recreation Area, and Camanche South Shore Recreation Area WTPs are followed in accordance with the respective Water Supply Permits.

In compliance with the SWTR requirements, EBMUD routinely submits a monthly water quality report to CDHS for each of the District's WTPs. This report typically contains the following, and is supplemented with other information as deemed necessary:

- Distribution System Bacteriological Test Results Report - percentage of distribution samples with detectable residuals.

- Monthly SWTR Summary of Monitoring - highlight of backwash data by exception.

- Organics/Inorganics Exception Report - exceedances of primary or secondary MCLs.

- Monthly Fluoride Report.

- Water Quality Complaints Summary.

Based on the results presented in these reports, the treated water from Walnut Creek, Lafayette, and Orinda WTPs met the approved turbidity requirement (less than 0.2 NTU, 95 percent of the time) each month they were in operation. This requirement, defined by CDHS for the District's water supply permit, is more stringent than the turbidity removal defined by the IESWTR. The District's WTPs surpassed the operating criteria of 80 percent turbidity removal of the monthly average raw water turbidity, and all operating criteria were met when filters were returned to service. In addition, the performance standard of maintaining a disinfection residual not less the 0.2 mg/L for more than four hours in any 24-hour period was achieved for all WTPs. Finally, based on a partial review of filtered water turbidities and the more stringent CDHS removal requirement, it is expected that the District's Walnut Creek, Lafayette, and Orinda WTPs have been meeting the IESWTR turbidity requirement of less than 0.3 NTU, 95 percent of the time, as well as the 1998 CDHS permit requirement that specifies 0.2 NTU in 95 percent of effluent samples for Lafayette, Orinda and Walnut Creek WTPs.

Water quality monitoring for Pardee Center, Pardee Recreation Area, Camanche North Shore Recreation Area, and Camanche South Shore Recreation Area WTPs is conducted in accordance with provisions of the individual Water Supply Permits, as directed by CDHS. The results of the small water systems' monitoring programs indicate that each of the four WTPs met the filtered water turbidity requirement of the IESWTR, i.e., less than 0.3 NTU, 95 percent of the time, each month of operation. Similar to the large systems, the small WTP s filters surpassed the operating criteria of 80 percent turbidity removal of the monthly average raw water turbidity, and all operating criteria were met when filters were returned to service. Finally, the performance standard of maintaining a disinfection residual not less the 0.2 mg/L for more than four hours in any 24-hour period was achieved at each of the WTPs.

Conclusions

Pardee and Camanche Reservoirs exhibit excellent raw water quality characteristics. The raw waters met the primary treated water MCLs for all general physical (excluding turbidity), general mineral (excluding aluminum for both Pardee and Camanche, and antimony and thallium for Camanche), inorganics, organics and radionuclide parameters. The raw water turbidity and total coliform levels were above the treated water MCLs that is expected. For Pardee Reservoir iron was detected at concentrations above the secondary standard. For Camanche Reservoir, both iron and manganese were detected in the raw water at concentrations above the corresponding secondary standards. Secondary standards are primarily concerned with taste or appearance of water rather than public health concerns.

There were no SOCs detected at concentrations above primary treated water MCLs in either of these two reservoirs. In Pardee and Camanche Reservoirs, the water quality monitoring data indicate that MTBE concentrations declined to non-detectable levels after two separate actions: the District initiated a program requiring all District-owned and concessionaire-owned 2-stroke high emission engines be replaced with 4-stroke low emission engines and the statewide MTBE ban in gasoline in 2003.

The District's WTPs: Pardee Center, Pardee Recreation Area, Camanche North Shore, Camanche South Shore, Walnut Creek, Lafayette, and Orinda WTPs are very effective and reliable at removing particulates and microorganisms. The monthly WTP reports, annual water quality reports, and annual inspection reports submitted to CDHS indicate that the treated or finished waters from these WTP s met all treated water quality regulations. In addition, disinfection residual and microbiological data from the District's distribution systems (as stated in the monthly WTP reports) showed that the District had no problems meeting the detectable disinfectant residual criteria of the IESWTR and LT1ESWTR. It is expected that the District will be able to meet the recently promulgated *Cryptosporidium* inactivation requirements as defined in the LT2ESWTR. With regards to the Stage 1 - D/DBP Rule, the source water TOC concentrations in both Pardee and Camanche Reservoirs (median TOC values of 1.6 mg/L and 1.5 mg/L (DOC), respectively) indicate that the District was not be required to pursue enhanced coagulation at any of the WTPs treating these source waters.

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Introduction

This section summarizes the potential contaminant sources identified in the previous Mokelumne Watershed Sanitary Survey (1995, updated 2000), and expands on that account using data made available in the update period. Agencies with jurisdiction in the watershed were solicited for data to assess each potential contaminant source. Staff from these agencies and from within the District were also interviewed and asked to fill out questionnaires to determine the status and development of contaminant sources. Sources of updates are listed at the end of each subsection. Field work consisted of site visits to the watershed immediately surrounding the Pardee and Camanche Reservoirs for the purpose of evaluating the District's small water and wastewater systems, and recreation areas adjacent to the reservoirs.

Since the 2000 MRWSS, there has been a substantial increase in the amount of watershed information stored on GIS, particularly by the District, Calaveras County, the National Forest Service, and the California Department of Forestry. This tracking tool allows for new quantification and mapping of contaminant sources, and lends itself to easier documentation of trends for future surveys.

Water quality parameters were grouped into five categories: general physical, microorganisms, radionuclides, inorganics, and organics. A detailed evaluation of water quality in the Upper Mokelumne Watershed with regard to these five categories was presented in Section 4.

Upper Mokelumne River Watershed

Potential contaminant sources are discussed in the following categories:

- EBMUD Facilities
- Water Resources Development
- Sanitation Facilities
- Hazardous Materials
- Urban Area Runoff
- Rural Area Runoff
- Utilities - Hydroelectric Power
- Transportation Corridors
- Agriculture
- Wildlife and Livestock
- Recreation/Public Access
- Mines
- Geologic Hazards
- Fires and Fuels management
- Logging
- Pesticides
- Unauthorized Activities

EBMUD Facilities

District facilities within the Upper Mokelumne River Watershed include the Pardee Reservoir (Pardee Dam and outlet tower), Pardee Recreation Area, and the District's Administration facilities located at Pardee Center (see Figure 2-3). Each of these facilities is discussed below with respect to potential contaminant sources.

Pardee Reservoir

Recreation at Pardee Reservoir is strictly controlled by the District in accordance with the provisions of the District's Water Supply Permits and the licensing requirements from the Federal Energy Regulatory Commission (FERC). Although boating is allowed at the reservoir, body contact with the water is not allowed. The reservoir is patrolled regularly to limit incidents of illegal body-contact.

A public health issue of potential concern is the provision of adequate sanitation facilities for boaters utilizing Pardee Reservoir. The District has addressed the problem by maintaining a combination of floating and shoreline toilets to meet visitor use demands. The District pumps out the toilets regularly and disposes the effluent to its Pardee Recreation wastewater treatment facility. The facilities are maintained and inspected on a regular basis.

Pardee Recreation Area

The Pardee Recreation Area is located in a rural area on the north shore of Pardee Reservoir at 4900 Stoney Creek Road in Ione, Amador County (Figure 5-1). The main roads into the area are Stoney Creek Road and Pardee Dam Road. There are no major businesses, care facilities, highways, hospitals, or schools in the immediate area. Predominantly undeveloped watershed and agricultural land surround the facility.

The Pardee Recreation Area encompasses approximately 245 acres. Table 5-1 summarizes the facilities at the Pardee Recreation Area. The remaining acreage is undeveloped watershed. Except for the water treatment plant, which is maintained and operated by the District, the facilities are maintained and operated by the concessionaire, Lake Pardee Marina, Inc.

Recreation. The recreation area is closed during the winter months from the end of October until the second Friday in February. Recreation is restricted to hiking, picnicking, camping, fishing and boating. No body contact activities are allowed. From updated visitor records, approximately 75,000 recreation visitor days per year occurred at Pardee, Recreation Area, which is the same as the previous 1995-1999 period. During the update period, the Pardee Recreation Area served an average of 247 visitors per day. In 2004, an average of 16 boats per day used the reservoir, compared with 27 boats-per-day in 1999. Table 5-2 summarizes the record of visitor use at Pardee Recreation Area for the update period.

Water Supply. The Pardee Recreation Area is served by the Pardee Recreation WTP which is described in Section 2.

Hazardous Material Storage. The water treatment plant for the Pardee Reservoir Recreation Area uses sodium hypochlorite for disinfection. The hypochlorite is stored in 15-gallon containers with spill containment. Any spills are contained locally in the water treatment plant building. An inventory of hazardous materials stored on site is performed annually and reported in the Pardee Recreation Environmental Emergency Response and Release Prevention Plan (ER Plan). A table of hazardous materials, as listed in the 2004 ER Plan is reproduced here in Appendix C.

Sanitation Facilities. Operation of the District's Pardee Recreation Area wastewater treatment plant is conducted under permit with the Regional Water Quality Control Board (RWQCB). The wastewater is routed to a primary treatment pond followed by a polishing pond. Table 5-3 summarizes the plant's characteristics. Upgrades since the 2000 MRWSS include the installation of spritzers in the ponds to increase evaporation of the effluent, the completion of a spray irrigation system above the pond area for land application of the effluent, and the construction of a wet well at the low point outside the ponds to allow pumping of any future overflows back into one of the ponds. Construction of this pump back facility was included with the construction of the Pardee Recreation Area waste water treatment plant. This plant applies 35 percent muriatic acid for pH control and chlorination using sodium hypochlorite into a chlorine contact chamber to achieve the permit-specified coliform inactivation. Any overflow would have previously drained into Carson Creek, which supplies Lake Amador in an adjacent watershed. Appendix D provides an overview of the monitoring program for the Pardee Recreation Area wastewater ponds

Hazardous Materials
In August 1997, three underground storage tanks were removed from above the marina store at Pardee Recreation Area. A grab groundwater sample from the excavation indicated that groundwater was impacted by hydrocarbon constituents. In November 1999, a soil boring was drilled to a depth of 50 feet and a groundwater sample was taken which indicates that hydrocarbon contamination is present. A groundwater monitoring well was installed on site in August 2000 and routine quarterly sampling will be conducted for four quarters, and the remaining volume of product in place will be calculated pending the groundwater monitoring results. Amador County and the RWQCB have approved all removal and monitoring work. A table of hazardous materials stored on site at Pardee Recreation is reproduced in Appendix C.

Pardee Center

Pardee Center is located in a rural area on the west shore of Pardee Reservoir, primarily in Calaveras County (Figure 5-2). The main roads into the area are Pardee Dam Road and Sandretto Road. There are no major businesses, care facilities, highways, hospitals, or schools in the immediate area. Undeveloped watershed and agricultural land surround the facility. Pardee Center is a District facility consisting of administrative offices, a chemical feed facility, equipment storage areas, a fuel-dispensing station, maintenance shops, a swimming pool, two residences, a water treatment plant, a wastewater treatment plant, and two small parking areas.

Water Supply. Pardee Center is served by the Pardee Center WTP which is described in Section 2 . In addition, a chemical facility for adding lime and sodium hypochlorite to the Mokelumne Aqueducts for pH adjustment and disinfection is also located on Pardee Center. In 2004 this facility switched to using liquid lime slurry.

Hazardous Materials Pardee Center WTP uses sodium hypochlorite for disinfection. Sodium hypochlorite is stored diluted to a one- percent solution in a 15-gallon container. Soda ash is used for corrosion control and is mixed in a 12-gallon container. Any spills are contained locally in the treatment building. An inventory of hazardous materials stored on site is performed annually and reported in Pardee Center ER Plan.

In June 2001, Pardee Center obtained a National Pollutant Discharge Elimination System (NPDES) Industrial Storm Water Permit from the California RWQCB for operations associated with the Pardee lime facility. The District developed and implemented a Storm Water Pollution Prevention Plan and a Monitoring and Reporting Program in compliance with the permit conditions. Samples have been collected twice per year since 2001 and the District has been in compliance with all permit conditions since obtaining the permit. A clean up of the abandoned Pardee Lime Tower in May 2005 removed the only significant source of potential storm water contamination from the site removing any potential environmental impact from the facility. The District is in the process of request removal from the storm water program in 2006.

Sanitation Facilities. The Pardee Center wastewater treatment plant is operated under permit with the RWQCB. Table 5-3 summarizes the plant's characteristics. Effluent from the wastewater plant is conveyed to a holding/settling tank with a capacity of about 1,000 gallons for additional treatment. The effluent from the tank is routed to a 2,900 gallon sump before disposal to a percolation pond. Any drainage from overflows (none have occurred in the past) would flow to the Pardee Spillway, which drains to Camanche Reservoir. Appendix D contains the new discharge permit for Pardee Center's wastewater treatment plant (WWTP), which is more restrictive. For example, the new max monthly average Biological Oxygen Demand (5 days) (BOD5) has been reduced from 40 mg/l to 20 mg/l, and additional criteria have been added that prohibits surfacing of wastewater outside the percolation ponds and requires the system to not flood or wash out during a 100-year storm.

Recreation Use at Middle Bar. In the summer of 2003, construction of the Middle Bar takeout facility was completed upstream of the Middle Bar Bridge. The project was funded using a state grant and EBMUD funds, and includes a 20-space paved parking lot, a two station handicapped accessible toilet and a short surfaced trail to the river's edge. No permits, fees, or access passes are required for the general public use of these facilities.

Water Resources Development

Existing hydropower and water supply projects on the Mokelumne River were described in Section 2. The two previous MRWSS documented PG&E's proposal for a reservoir enlargement project which would increase the Lower Bear Reservoir's capacity from 52 TAF to 78 TAF, and a proposal by the Mokelumne River Water and Power Authority for a 40 TAF, 31 megawatt-capacity Middle Bar Reservoir on the Main stem of the Mokelumne River. PG&E dropped the reservoir enlargement project, and no further action has been taken towards the Middle Bar Reservoir Project. San Joaquin County had also pursued a plan to build water supply reservoir in the Middle Bar but abandoned the project in 2003.

San Joaquin County or the Mokelumne River Water and Power Authority (MRWPA) informed the participants at the September 15, 2005 Mokelumne Water Forum meeting that they are requesting a cancellation of their Middle Bar application with the SWRCB. They are continuing to pursue power generation with the Duck Creek Reservoir alternative under the Mokelumne River Regional Water Storage and Conjunctive Use (MORE WATER) Project.

Sanitation Facilities

The sanitation facilities in the Upper Mokelumne River Watershed include wastewater collection and treatment systems, septic tank and leach field systems, and chemical toilets. Chemical toilets are largely associated with recreational activities and are discussed in the Recreation section.

Wastewater Collection and Treatment Systems

Table 5-3 summarizes information on the five small community wastewater systems in the Upper Mokelumne River Watershed. As noted on the table, no direct discharges occur to any surface waters of the watershed; effluent restrictions for each wastewater treatment facility also are listed in the table. Each of the wastewater disposal systems has a non-discharging system permit from the Central Valley RWQCB. The RWQCB also has primary responsibility for monitoring, inspection, and enforcement proceedings for each of the five systems. The locations of these wastewater facilities are shown on Figure 5-3. Pardee Center and Pardee Recreation Area wastewater systems are discussed under "EBMUD Facilities."

Amador Water Agency also maintains several wastewater systems that serve the small communities north of Tiger Creek Reservoir. The systems consist of multiple septic systems emptying into a common tank, which feeds a leach field or spray disposal fields.

The risk of sewage overflows from wastewater treatment and disposal facilities is associated primarily with overuse of these existing land disposal sites. Historically, this is believed to have happened in the Mokelumne River watershed, primarily from the Mokelumne Hill wastewater treatment plant; however, this has not been confirmed by the RWQCB. A survey of incident reports from the EBMUD's regulatory compliance office and the state Office of Emergency Services showed no sewage overflows in the watershed for update period.

Wastewater collection systems, in addition to the discharges from the treatment facilities, constitute potential sources of contamination by microbiological constituents. Figure 5-3 shows the service areas for the wastewater systems discussed above. The systems may be vulnerable to spills in the event of pipe failures, accidental breaches due to adjacent construction activities, or overflows induced by wet weather infiltration.

Septic Systems

Most of the developed area of the Mokelumne River watershed is on sewers and is dependent upon individual sewage treatment systems. Figure 5-5 shows the significantly developed areas of the watershed. In the 1995 MRWSS, census and sewer service GIS data were used to estimate 5,376 persons in 3,205 households that rely on septic tanks in the entire upper watershed. Using the 2000 Census, estimates for the watershed varied from 4639 to 10,598 persons. The variation depends on whether the census blocks used are entirely inside watershed boundaries or whether blocks include those merely intersecting the watershed boundaries. If only the blocks which had census centroids inside watershed boundaries, then the total population would be 8,046 persons in 4,230 homes. In Amador County, there are no known major areas in the watershed that display contamination stemming from septic tank leakage, and the percentage of problem sites is low.

The county health departments are responsible for implementation of, and monitoring compliance with, septic tank design criteria and standards. They issue permits and inspect new construction sites for compliance. The RWQCB is responsible for ensuring that the counties take appropriate steps to prevent non-point sources of pollution such as septage from entering surface or groundwater bodies in quantities sufficient to impair water quality needed to protect beneficial uses, including domestic water supply.

The U.S. Forest Service (USFS) is not required to comply with County septic tank standards when its permits are written or renewed. However, USFS staff normally consults with the counties on issues dealing with the renovation or closure of failed systems.

North Fork

Only small portions of the North Fork sub-watershed are suitable for septic tank systems due to the generally excessive steepness of the terrain and the unsuitability of much of the massive granitic batholith bedrock underlying most of the higher elevations. Comparison of the population densities shown in Figure 5-5 with the location of wastewater treatment facilities in Figure 5-3 show that most of the septic tanks are located in Amador County, along Highway 88, on the ridge separating the Mokelumne and Consumnes River drainages; and are primarily concentrated in the Buckhorn area. No exact estimate of the number of septic tanks present in Amador County is possible at this time because limited records have been kept. The 2000 MRWSS reported that Amador County records showed 7,135 applications for septic tank systems from 1978 to 1999. In 1995, a rough estimate was made based on GIS analysis, and yielded 1,825 persons in 1,310 households on septic systems.

Not all of the systems are situated on private land. Approximately 45 recreational residences are permitted on Eldorado National Forestlands. These residences are owned on lands leased through special permits from the USFS and none are sewered. They are almost exclusively summer cabins. They are all located on the Bear River Reservoir Tract on lots that average 100 x 150 feet in size.

Some residences served by septic tanks are also situated on Stanislaus National Forestlands in the vicinity of Bear Valley, and between Bear Valley and Salt Springs Reservoir. However, most of the residences in the resort area of Mt. Reba-Bear Valley and a large part of the ski area development are located outside the watershed boundaries

Middle Fork

Most of the septic tank-served residential areas of the Middle Fork sub-watershed are situated around the outskirts of the sewered communities of West Point and Wilseyville. A 2000 WSS performed for Calaveras County Water District (CCWD) and Calaveras Public Utility District (CPUD) (Tetra Tech, 2000) noted elevated coliform in river flows and cited the Lynn Park Acres subdivision, with several homes adjacent to the river on septic systems, as a potential contaminant source. CCWD maintains some septic systems in this sub-basin, and estimates 4-5 overflows per year, all of which are contained on-site. The 1995 GIS analysis yielded an estimate of 1,522 persons in 856 households on septic systems.

South Fork

Most of the unsewered development in the South Fork sub-watershed is concentrated in the lower half of the basin. The densest concentration of homes is in the Railroad Flat area, with 101 to 300 houses per square mile. A previous watershed sanitary survey (Tetra Tech 2000) noted three residences adjacent to the CPUD pumps station on Licking Fork, and five other residences around Jeff Davis Reservoir, and classified the threat potential from septics as "low." Except for the area just to the south of Wilseyville, the remaining developed areas have densities from 6 to 50 houses per square mile.

Mainstem

Most of the unsewered area of the lower sub-watershed is concentrated in the Clinton area, where home densities exceed 300 houses per square mile in places, but are more typically in the 100 to 300 homes per square mile range. Other developed areas occur along Route 26, to the north of Mokelumne Hill, and to the southeast of Pardee Reservoir. The 1995 GIS analysis yielded an estimate of 1,204 persons in 545 households on septic systems.

Solid Waste Disposal Sites

The State Solid Waste Management Board has the overall responsibility for regulation and management of solid wastes within the watershed. There are no solid-waste landfills nor transfer stations located within the North Fork, Middle Fork, or Main-stem sub-watersheds of the Mokelumne River. The only solid waste-handling site located within the Upper Mokelumne River Watershed is the Wilseyville Transfer Station, in the South Fork sub-watershed, about one-third mile south of Wilseyville. Its location is shown in Figure 5-3. This transfer station operates four days a week: Friday, Saturday, Sunday, and Monday. About ten tons of municipal solid waste is transferred each operating day. The transfer station is too small to warrant a wastewater treatment facility. There have never been any complaints of odor or other problems at this facility, and it is not judged to be a contaminant source of concern to public health.

Hazardous Materials

Underground Storage Tanks (USTs)

The 2000 MRWSS reported that UST's presented a low threat as a contaminant source due to very low density, sufficient distance from streams, and stringent requirement for containment at storage facilities. Table 5-4 contains the current list of documented leaking underground storage tanks in the Upper Mokelumne River Watershed, as reported by the RWQCB Figure 5-3 illustrates their locations. Amador, Calaveras, and Alpine counties state that the majority of storage tanks within the watershed area contain fuel and other petroleum products including gasoline, diesel fuel, and liquefied petroleum gas (propane). Figure 5-3 also shows the location of other known underground storage tanks in the watershed.

Most of the leaking underground tanks in the North Fork sub-watershed, are located in the Pioneer area on Highway 88. All six documented leaking tanks in Bear Valley are in post-remediation. Other tanks that could be prone to leakage are located in small communities, such as Buckhorn, primarily along Highway 88. Three sites highlighted on Table 5-4 have been remediated since the 2000 MRWSS. In the Middle Fork sub-watershed, there are seven leaking USTs in West Point and Wilseyville, and the four highlighted on the table are undergoing or have undergone remediation since 2000. The status of the two leaking underground tanks recorded for the South Fork area in Railroad Flat hasn't changed. For the Main-stem, one additional leaking UST has been found since 2000, and a site assessment is underway.

Other Hazardous Chemicals

As previously reported, PG&E has replaced the polychlorinated biphenyl (PCB) transformers in its powerhouses with mineral oil-filled distribution transformers, thus greatly reducing the risk of hazardous Polychlorinated Biphenyls (PCBs) explosions and spills.

The Calaveras County Fire Department reports that there have been several cases of metamphetamine drug lab seizures in the communities of West Point, Paloma, and Railroad Flat. From the State Office of Emergency Services (OES) records for update period, there were eight hazardous materials reports involving drug labs in the area, all located in Calaveras County. The chemicals reported were generally described in the reports as "drug lab waste" ranging in quantity from small containers to 55 gallon drums. Chemicals subject to illegal disposal at these sites can include hydrogen chloride, liquid hydrochloric acid, trichloro-fluoro-ethane, methylamine, and red phosphorous.

Releases of hazardous substances in the Upper Mokelumne Watershed are documented by EBMUD's Regulatory Compliance Office. There were three spills on the roads in the update period, which are documented under "Transportation Corridors." Otherwise, no such releases were recorded in. The only spill reported in previous MRWSS was a fertilizer spill in the North Fork documented in 1995.

Hazardous materials stored on EBMUD facilities are discussed under "EBMUD Facilities" in this section.

Urban Area Runoff

This section describes potential contaminant sources from urban areas within the Upper Mokelumne River Watershed. Urban land uses include single-family residential, multi-family residential, and commercial and public facilities (excluding parks and recreational facilities such as golf courses). The significant urban areas present are the unincorporated communities of Mokelumne Hill, West Point, Wilseyville, and parts of Glencoe and north part of Railroad Flat in Calaveras County, and Pine Grove, Pioneer, Buckhorn, and the southern portion of the City of Jackson in Amador County. The 2000 MRWSS Update described in detail the potential contaminants that are associated with urban areas. These include pesticides and fertilizers, paints, wood preservatives, streets and driveways, construction sediments and wastes, domestic animal wastes, automobile-related sources.

The potential impacts of urban areas on the watershed increase with population growth. For Calaveras County, populations in 2000 were available for Mokelumne Hill (774), Railroad Flat (549), and West Point (746). Most growth in Calaveras County is occurring in the south part of the county (Copperopolis and Angels Camp) that drains into the Stanislaus Watershed. Estimates from Calaveras county Building Dept are that 50-60 homes have been built in the last five years in Mokelumne Hill/West Point/ Wilseyville communities in the Mokelumne watershed, and about 60% on septic systems with the rest on sewer. At Highway 49 just south of the Mokelumne River, eight five-acre parcels are in the planning stages of development. Calaveras County's General Plan Housing Element projects a 2.3% growth rate between 2005 and 2010, and a need for 3,289 residential units to fill the need of the unincorporated county's population.

In Amador County's General Plan Housing Element, 2% annual growth is expected in unincorporated areas, which includes the communities of Pine Grove, Pioneer, and Buckhorn in the Upper Mokelumne River Watershed. The Housing Element projects that 946 new residential units will be needed by 2009. Mokelumne Bluffs is a 138-acre, 132- unit development currently undergoing environmental review in the community near Pine Grove. Growth is more rapid in the incorporated cities of Amador County, such as the City of Jackson.

In the south part of the City of Jackson, development has accelerated in the past few years owing to immigration. There are two projects currently under construction in the City of Jackson that are in the Mokelumne Watershed: Jackson View Estates, a 127-unit single family residential (SFR) development along Scottsville Road, and Pine Meadow of Jackson Creek, with 28 SFR units and 12 bungalows. Future development includes Jackson Hill (540 homes, about half draining to Mokelumne Watershed). Recent increases in population growth warranted a four-month housing moratorium while the City of Jackson wrote new guidelines that specified criteria for potential housing projects. The new guidelines required builders to incorporate benefits to the city in the form of schools, drainage facilities, and parks.

Runoff from construction sites is regulated by the RWQCB which outlines Best Management Practices (BMPs) for runoff management /monitoring, and can require a Storm Water Pollution Prevention Plan. City and county public works staff generally oversee construction sites and report violations.

New developments can have a variety of effects on the watershed with water quality implications including: increased urban runoff, increased wastewater flows, loss of vegetation, and increased erosion (especially during construction activity and when attention to road and culvert maintenance is inadequate). Consequently, the encroachment of development upon watershed lands should be carefully monitored and assessed.

The impacts of construction runoff can be illustrated by an incident on January 2005, when an EBMUD ranger noticed a high turbidity plume in the Mokelumne River just upstream of the Middle Bar Bridge. District staff tracked the source to a drain in the Scottsville Road, Thomas Drive area in south Jackson, in the vicinity of several construction projects. Turbidity readings at the confluence of the adjacent creek with the Mokelumne River were 55 NTU. Amador County and City of Jackson public works staff was alerted about the problem.

GIS data from Amador and Calaveras County Plans shows urban areas in the Upper Mokelumne River watershed (Figure 5-4), and the Table 3-1 lists the breakdown of land usage.

Stormwater Drainage Overflows

There are few areas from which significant quantities of urban runoff directly enter the Mokelumne River system. Communities and developing areas in the watershed utilize ditches and intermittent natural stream channels as conveyance courses for their minor quantities of stormwater drainage.

Rural Area Runoff

As noted in the 2000 MRWSS, the potential contaminant sources and water quality concerns associated with rural area runoff are similar to those associated with urban area runoff, and the residential component of rural areas is considered to produce the most significant impacts from this land classification. For this update, changes in residential development are discussed under "Urban Area Runoff." Septic systems, agriculture, and wildlife and livestock are potential contaminant sources associated with rural areas that are addressed under "Sanitation Facilities," "Agriculture," and "Wildlife and Livestock" respectively.

Utilities - Hydropower Generation

The 2000 MRWSS Update documented possible contaminants that are generally associated with hydropower generation facilities. While there are a number of agencies with hydroelectric facilities in Upper Mokelumne River Watershed, PG&E's facilities are clearly the most extensive. Of particular importance is PG&E's Project 137. Project 137 encompasses PG&E's hydroelectric facilities and related reservoirs, tunnels, and power plants in the Upper Mokelumne River Watershed. These facilities are described in Section 2. The potential contaminant sources associated with the PG&E facilities can also be applied, to a lesser extent, to the smaller hydroelectric operations owned by other utilities in the Upper Mokelumne River Watershed. The major facilities related to transmission and distribution includes power lines carried on towers and poles. Administrative facilities, switching centers, and service centers may be located at or away from the powerhouses. These centralized facilities generally include office space, vehicle equipment storage, and repair and maintenance shops. Appurtenant facilities include small staging areas, valve houses, air valve housing for siphons, remote platforms for storing cloud-seeding equipment, and helicopter pads. In addition to the many roads -- both paved and unpaved -- and vehicular traffic associated with PG&E facilities, occasionally helicopters and boats are used.

Hydropower

Hydroelectric operation of PG&E's reservoirs may impact streamflow and water quality characteristics downstream of its facilities. Variations in stream flow due to power generation and/or reservoir release practices may impact stream bank erosion, sediment transport, and water quality.

Canal Maintenance.

PG&E encounters significant problems removing attached algae from its extensive canal and flume system. Left unchecked, the attached algae would quickly become sufficiently dense to impede flow through the canal system and clog the turbines and penstocks. This situation indicates the magnitude of the problem of biostimulation from the input of nutrients, and the growth-enhancing effects of elevated water temperatures attained in the canals and flumes. PG&E's maintenance process consists of draining the canals and running a truck-mounted water jet, with high velocity nozzles directed to blast the algae loose. Most of the nutrients are removed as part of the biomass when algae are blown out of the canal; however, some remain in the canal to be flushed upon refilling, and thus remain in the system. Of additional concern are the elevated water temperatures, which stimulated the algal growth in the first place. These increased temperatures can impact downstream fish populations, aquatic habitats, and potentially Pardee Reservoir water quality. Elevated temperatures stimulate algal growth, which can cause taste and odor (T&O) events, and elevated organic carbon concentrations, which become problems for drinking water utilities.

Transportation Corridors

Figure 2-1 provides an overview of the major transportation corridors within the Upper Mokelumne River Watershed. The primary water quality concern is surface runoff from roads and parking areas. Contaminants associated with transportation corridors include automobile-related petroleum hydrocarbons and metals, turbidity from erosion caused by rapid runoff, and inadequate or failed stormwater collection systems and from construction and maintenance activities, pesticides applied along road shoulders, and chemicals from accidental spills and illegal dumping. The 2000 MRWSS described in further detail the types of contaminants associated with these sources (e.g. lead, copper, nickel and zinc as typical metals). New urban developments, discussed in "Urban Runoff" above, will increase traffic and pollution associated with transportation corridors. For example, the Draft Environmental Impact Report (EIR) for the Mokelumne Bluffs project near Pioneer estimates 1,124 additional daily vehicle trips in the area of the new 138-unit development. Table 5-5 shows a comparison of highway traffic counts between 1995 and 2004 (approximately 5-6 percent of traffic is composed of trucks). The table shows that traffic either remained the same or increased slightly in the area, with the exception of Highway 88 near Pine Grove where daily traffic increased 160 percent, suggesting increased development in the area.

History of Spills and Accidents

The State OES maintains an archive of Hazardous Materials Spill reports. Records for the update period were reviewed. Three spills were recorded in 2003 as the result of vehicle accidents. The spilled materials were limited to hydraulic fluid, diesel fuel, and antifreeze. All spills were contained, and there are no known impacts to waterways and water quality. Spills related to accidental collisions may be estimate from California Highway Patrol Annual Reports of Fatal and Injury Motor Vehicle Traffic Collisions. The most current report for 1993-2002 summarized injury accidents by county and is shown in Table 5-6. These accidents were not broken down by watershed.

With regards to paved roads, there is very little activity on paved road construction and reconstruction, aside from some limited road widening projects, mainly on Highway 88. Such projects are usually constructed during the dry season and repaved before prolonged wet weather sets in, and must meet fairly stringent state and/or federal mitigation requirements. Erosion associated with paved roads is insignificant when compared to unpaved roads. However, surface runoff is of a greater concern with paved roads.

In 2000, Caltrans completed construction to widen a 0.8 mile section of Route 88 in the Amador County portion of the North Fork sub-watershed. The widening project is located between Amador 88 post miles 35.1 and 35.9. Caltrans also reports the repair of small soil and rockslides at various locations along Highways 88 and 4 during, and after, rainstorms.

Risks Due To Public Access. There is very little activity involving the transport of hazardous materials in the Upper Mokelumne River Watershed. No railroads, and only two major highways, traverse the watershed, and they are used only rarely to transport dangerous substances -- mainly for local use. Due to their lower summit elevations, wider rights-of-way, and less serpentine (winding) routes, Interstate 80 and Highway 50 to the north are the preferred trans-Sierra and interstate routes versus Highways 88 and 4. Interstate 5 and Highway 99 are the preferred north-south routes compared to Highway 49 for similar reasons.

The risk of highway accidents or public access in the sub-watersheds resulting in hazardous materials contamination of Pardee Reservoir is considered very low. Nonetheless, the potential consequences of a disastrous spill in the Mokelumne River and ultimately Pardee Reservoir, warrant future vigilance by Caltrans and the California Highway Patrol regarding hazardous materials transport policies in the watershed to make sure that the risk of contamination remains acceptably low.

Potential secondary risks of hazardous materials contamination originate from more routine releases such as leaking or overheated radiators and spillages at refueling stations. However, the chances of residues from such minor spills reaching the Pardee Reservoir in any detectable quantities are exceedingly low due to the generally adequate distances between the highways and the Mokelumne River and its tributary streams.

Agriculture

The MRWSS Update 2000 concluded that agricultural activity has minimal impact on water quality in the Upper Mokelumne Watershed due to the small size and quantity of farms. In general, agricultural land is not of primary interest as a source of microbiological contamination, but could contribute particulates, pesticides, and nutrients and metals from fertilizers. Figure 5-4 maps lands classified as Agricultural the California Fire and Resource Assessment Program (FRAP). Farms in the Calaveras County portion of the watershed are located primarily near the communities of Wilseyville and West Point. Crops grown are predominantly wine grapes, walnuts, and pistachios. In Amador County, there are small farms growing mainly wine grapes and walnuts, but there are no significant agricultural areas within the watershed.

PG&E does not conduct agricultural activities itself, but has entered into leases and other agreements that allow agricultural activities on PG&E lands. These activities include Christmas tree farming and grazing. In addition, PG&E has contracts under which it provides water for irrigation to support agricultural land uses. Typically these leases or agreements have terms of three to five years.

Wildlife and Livestock

While livestock are the greatest contributor of animal waste in the Upper Mokelumne River Watershed, birds and mammals can introduce microorganisms into Camanche Reservoir and its tributaries through direct contact or animal waste. Deer, beavers, muskrats, skunks, coyotes, California ground squirrels, gulls and geese, which are common species occurring in the Upper Mokelumne River Watershed, are associated with microbial contamination of drinking water supplies. Significant pathogens associated with animal waste include *Cryptosporidium parvum, Giardia lamblia, Salmonella, E. coli* and avian influenza.

Livestock grazing activities can affect public water supplies in a number of significant ways: (1) introduce and transmit disease-causing microorganisms into raw drinking water supplies; (2) elevate nutrient loads; (3) increase erosion; (4) compact soils and thereby decrease ground water recharge, and (5) disturb riparian corridors and tributary stream banks by animals gaining access to water supplies. Some of these impacts occur proximate to tributary water supplies unless reservoirs are out-fenced above the high water line

Grazing on National Forest Lands

Both the Eldorado and Stanislaus National Forests are used extensively as open rangeland subject to federal leasing agreements. Sierra-Pacific Industries also permits grazing on its lands subject to USFS lease agreements. The maximum number of cattle permitted is determined annually by the USFS when the leases are negotiated. Numerous private landowners manage ranches dedicated to horses, cattle, and sheep. A small percentage of the pastures are irrigated where water supplies permit, and the rest are utilized as dry pasturage. No significant penning or product processing areas was identified on the watershed, and the calving/lambing and transport loading areas were judged to have no special overall significance due to their extremely small areal extent.

There are 12 permitted grazing allotments within the Upper Mokelumne River Watershed that are managed by the Eldorado and Stanislaus National Forests. As depicted in Figure 5-6, the allotments located on the north side of the North Fork Mokelumne River are permitted by the Eldorado National Forest, while those on the south side are permitted by the Stanislaus National Forest. Table 5-7 shows the total permitted numbers of livestock (cows and calves) grazed on each allotment. The permitted number allowed has been reduced in six of the allotments, most notably Lower Blue (from 338 to 269) and Mokelumne (from 328 to 255). An ecological analysis is being conducted to decrease the Pardee allotment. These reductions are consistent with the Sierra Nevada Forest Plan Amendment guidelines, which specify reduced grazing utilization of 30 to 40 percent, mandate an ecological analysis of meadows every 3 to 5 years to determine impacts of grazing.

Grazing on District Lands

At this time, the District has nine grazing leases in the Main-stem sub-watershed, covering 12,983 acres. The leases allow for the utilization of 7,482 animal unit months of forage. Wells, springs, ponds and municipal water sources provide stock water. Table 5-8 lists the grazing leases currently in force in the Pardee Watershed. The total AUMs is slightly lower than reported in the 2000 update. Figure 5-7 indicates the approximate location of these grazing leases. The District develops annual grazing plans in conjunction with lessees, stipulating the allowable Animal Unit Months (AUMs) for specific ranges. The stocking levels are dependent on rainfall and subsequent forage production each year. Annual spring surveys are conducted to measure the amount of forage production on each pasture. These figures may be used to modify the allowable AUMs on a lease in a given year.

Tenants are required to distribute or rotate their livestock among the pastures to minimize overgrazed areas and reduce overall fire hazards. Annual fall surveys are conducted to monitor the effects of grazing and to measure the residual dry matter on the pastures.

Grazing on Private Lands

Between District lands near Pardee Reservoir and the National Forests in the upper watershed is private land where grazing and livestock ranching is known to occur. PG&E has agreements to lease land for activities including grazing, and Sierra Pacific Industries (SPI) allows grazing on its land subject to USFS requirements. Since permits are not required to raise livestock on privately owned land, County or State agencies do not keep records. The county agricultural commissioners track the head of cattle sold, which give some indication of the amount of grazing activity in the county, though not specific to the Upper Mokelumne River Watershed. In Calaveras County, two cattle ranches were identified: Garamendi/ McSorley Ranch in Mokelumne Hill, and Hertlein Ranch in West Point. There are no major feedlots within the Upper Mokelumne River Watershed nor is there any agency, outside of the RWQCB, that has the authority to oversee livestock waste management.

Recreation

Numerous activities are included under the heading of recreation, as depicted by Figure 5-9 for the Upper Mokelumne Watershed - camping, backpacking, pack animal-assisted hiking, hunting, equestrian activity, boating, fishing, day-use activities, hiking, bicycling, picnicking, skiing, swimming, white water rafting, and off-road vehicle use. Recreation associated with the District's facilities within the Upper Mokelumne Watershed is addressed under the section entitled EBMUD Facilities. For a discussion on the potential impacts on water quality due to recreation, including erosion, vandalism, sanitation facilities, and introduction of human and animal wastes, refer to the previous MRWSS.

Body-Contact Recreation. All known body-contact water recreation sites within the watershed are contained in the North Fork and Main-stem sub-watersheds. Body-contact water recreation sites within the North Fork sub-watershed, are depicted in Figure 5-8. Table 5-9 summarizes managed recreation sites and lists the activities and numbers of users. The most prominent body-contact recreation along the North Fork occurs at the Bear River Resort and group facilities, while Blue Lakes and Bear River South Shore rank next highest in use, respectively. Moore Creek and White Azalea also receive significant levels of public usage. White water recreation opportunities exist from the Bear River confluence down to Tiger Creek Afterbay. The first run (Class III-V) which extends from Bear River to Devil's Nose, is suitable for intermediate to advanced kayakers and rafters, depending on the volume of flow. The second run (Class V), which continues from Devil's Nose to Tiger Creek, is suitable only for expert boaters. These runs receive minimal use since access is very difficult, over poorly maintained logging roads, and there are no facilities.

Since the 2000 MRWSS, re-licensing negotiations for PG&E's Project 137 resulted in many additional recreation enhancements along the North Fork. The enhancements include a minimum number of whitewater releases during the whitewater boating season (May through September), and development of whitewater boating access facilities, including vault and portable toilets, parking areas, barrier rocks for resource protection, and signage for the Tiger Creek, Ponderosa Way, and Devil's Nose, and Electra Runs.. The license agreement also provided for funding of two river rangers during the whitewater boating season. Senator Barbara Boxer's California Wild Heritage Act included a national "wild and scenic" designation for the 17 mile stretch from Salt Springs Dam to Tiger Creek Powerhouse. The designation would prevent construction of dams and diversions on the reach, and is expected to be re-introduced in 2005.

The Electra Run, from Electra Picnic Area to State Route 49, is the most heavily used stretch on the Mokelumne River. It is used by rafters, canoeists, inner tubers, and kayakers. As discussed in EBMUD facilities, a kayak takeout for this run was constructed near the Middle Bar Bridge in 2003. No consistent records or detailed estimates are kept for the numbers of white-water recreational boaters or rafters on any of the river reaches. Rough estimates from the Amador County Sheriff's Department indicate that on a typical summer weekend day approximately 30 kayakers, inner-tubers, canoeists and other river floaters utilize the river.

Non-Body Contact Recreation

Privately-owned boats that can introduce various contaminants from different recreational water bodies are a serious concern for the District. Boating policies continue to be enforced at the District’s recreation facilities to prevent the introduction of exotic species to Pardee and Camanche Reservoirs. Though all boats cannot be inspected for invasive aquatic organisms, monthly Zebra mussel sampling in 2005 for the mollusk by the Department of Water Resources resulted in no detections in Pardee.

Primary non-body-contact recreational activities in the watershed consist of fishing, camping, hunting, boating, alpine skiing, cross-country skiing, hiking/backpacking, snowmobiling, off-highway vehicle (OHV) use, wildlife observation, nature photography and mountaineering. Most of the activities occur on public lands or at public recreation facilities above 2,000 feet in elevation, in the snowbelt, and where summertime temperatures are cooler.

No new information is available for U.S. Bureau of Land Management lands. These lands are not managed for recreation, and use consists primarily of hiking, hunting, fishing and wildlife viewing along, and near, unpaved roads throughout its 171,700 acres of owned lands.

Pollution controls within National Forest lands are primarily the responsibility of the USFS. The controls are implemented through the standards, policies and guidelines established in the Land and Resources Management Plans of each National Forest. The controls are enforced by the Forest Supervisors' and the individual Rangers' offices in accordance with their individually established procedures.

Schaad's Reservoir is the only significant recreational site located in the Middle Fork sub-watershed. The 1,800 ac-ft reservoir is used by CPUD for water storage. The recreation site on the reservoir is a private facility of very limited size which allows only camping and fishing.

There are no significant recreational facilities located in the South Fork sub-watershed. With the exception of recreation areas below Electra Powerhouse, all recreational facilities located within the Main-stem sub-watershed occur on District lands and are addressed under the section entitled EBMUD Facilities.

The intensity of body-contact and non-body-contact recreation and use is indicated by the number of recreational sites and visitor days reported by Eldorado and Stanislaus National Forests, PG&E, and the District. All of the recreational areas and facilities that were inspected were found to be in generally excellent hygienic condition with minimal litter and garbage residues.

For the most part, hiking trails did not appear to be subject to excessively heavy use, and no areas of abuse or litter were found. Restroom facilities were generally clean and well maintained.

Off-Highway Vehicle (OHV) Use. Off-highway vehicle use continues to be a widespread and severely damaging recreation activity within the Upper Mokelumne River Watershed. Erosion from unpaved roads and trails can be a major source of sediments and contaminants. Extraordinary efforts have been required in some cases to curtail damage to unpaved roads on privately controlled and patrolled lands. Public and minimally patrolled lands are especially vulnerable to damage. The locations of some of the off-road vehicle roads are indicated on Figure 5-8.

On Sierra-Pacific lands, unpaved roads have been closed in recent years to control erosion. However it has proven difficult to impose controls upon private off-road vehicle owners, and SPI has noted a dramatic rise in the amount of OHV traffic in the past several years, accompanied by increasing damage to roads. SPI is working to control access by increasing patrolling, better signing and gates, and increased enforcement by public law enforcement agencies. SPI is also working with adjacent property owners and with the local counties to coordinate enforcement actions. The 2000 MRWSS documented some method SPI used to prevent illegal use of their logging road network, including earthen berms and locked gates.

OHVs and unmanaged recreation in general are part of the “Four Threats” designated by the USFS (the others are Fires and Fuels, Invasive Species, and Loss of Open Space). Two major erosion problem areas caused by OHV vehicle use were reported by the USFS. The first area is in the Eldorado National Forest portion of the North Fork sub-watershed, just downstream from Salt Springs Reservoir, immediately adjacent to the river. Damages included destruction of water-bars, campground facilities and culverts. The second area is along a segment of the Old Carson to Big Trees Wagon trail, in the vicinity of Deer Creek and Deer Valley Road. Similar damage was recorded in this area. Control measures which included reconstruction, signing, and intensified enforcement of off-road vehicle regulations, have been fairly effective.

Within the Middle Fork, South Fork, and Main-stem sub-watersheds, access control has been somewhat effective at keeping off-road vehicles off vulnerable earthen roads. Despite local evidences of damage, the Upper Mokelumne River Watershed appears to be in generally good condition. Private landowners are increasingly turning to fencing and gating to prevent damaging intrusions of off-road vehicles but it remains unchecked at this time. This leaves the 171,000 acres of USFS non-wilderness lands as the major area of concern with respect to off-road vehicles in the watershed.

Increased vigilance and more intensive control programs may be needed now and in the future to adequately protect the watershed in the face of intensifying development and recreational use pressures. The problem is potentially serious and could cause future water quality problems in Pardee and Camanche Reservoirs, the lower Mokelumne River and the tributary streams of the watershed.

Mines

Mines and quarries have the potential for being identified as contaminant sources for turbidity, radionuclides, general minerals, metals, oil, grease and hydrocarbons depending upon type of materials being processed and the size of operation. Three permitted mines are identified as being active in the Upper Mokelumne River Watershed -- one in the North Fork sub-watershed and two in the Middle Fork sub-watershed. Figure 5-9 highlights the location of each mine. These privately owned, permitted mines are believed to be operated one or two days a week. As of the 1995 MRWSS, State and local agencies report that water quality concerns associated with drainage waters were non-existent. There are no further updates on mine activities.

The 2000 MRWSS reported that in 1997 the District received notice from the owner of Gwin Mine that emergency remediation measures were being implemented to control a hydraulic discharge at the main shaft caused by the heavy rains that year. The owner had been conducting water quality sampling as the first step toward receiving approval from the RWQCB to dewater the mine. Elevated levels of arsenic and sulphur concentrations were found to exist in these waters and as the water exited the mine. Three emergency efforts were pursued by the owner -- sealing the entrance points where surface waters entered the mine, interim onsite treatment of discharge from the main shaft for arsenic and sulphur, and placement of a geochemical barrier downstream to neutralize any potential acidity. No further activity has been reported to the District since that time.

Geologic Hazards

Geologic hazards include erosion and landslides, which can increase turbidity and nutrient loads to a water supply. The 1995 and 2000 MRWSS concluded that the greatest impacts from soil erosion occur near the reservoir where even small rainfall events can transport the sediments over a short distance. In the past, landslides triggered by heavy rainfall events have resulted in elevated turbidity loads to Pardee Reservoir. A landslide above Salt Springs Reservoir in January 1997 created a turbidity plume that forced a shutdown of the aqueduct. Turbidity exceeded 100 NTU and would have overwhelmed the District's inline water treatment plant in the East Bay. Earthquakes can also trigger landslides, but as noted in the Section 3, the area has little recent history of fault movement.

All of the documented instances of erosion and landslides have occurred on the North Fork and Main Stem of the Mokelumne River. Locations of historic gully and erosion as of 1974 were documented in the MRWSS 2000 Update (p. 63)

Fire and Fuels Management

Potential impacts of fires and fuels management on water quality are well documented and summarized in the previous MRWSS. Water quality can be impaired by increased runoff and erosion and hydrophobic soil conditions caused by fires. Fuel management measures such as pesticide application, mechanical vegetation removal, and grazing can also impact water quality, as discussed "Pesticides" and "Wildlife and Grazing" in this Section 5. Fires that occurred in the Upper Mokelumne Watershed in the update period are mapped on Figure 5-10. Wildfire statistics are summarized in Table 5-10.

Fire danger is greatest on lands that are not managed to reduce fuel supplies, provide fire breaks, or afford ready access by fire fighters and their equipment. This is most extreme in remote canyons and on the steep, densely vegetated canyon walls. Clear and select cut timber harvesting serves to temporarily lower fire danger by reducing fuel supplies, increasing the spacing between fuels, and ensuring for the routine presence of short response-time work crews within the forested areas. Most fires are discovered and extinguished during their early, manageable stages by on-site logging personnel, backed up by on-call California Department of Forestry and Fire Protection, and USFS fire fighters.

Official fire management and control responsibility in the National Forests belongs to the USFS. Responsibility on private lands is shared by the California Department of Forestry and Fire Protection, local fire districts, and private landowners. Prescribed burns are frequently conducted, especially on federal lands, to prevent or eliminate excessive accumulations of fuel and to open up firebreaks. This measure is being implemented to reduce the probability of catastrophic fires in the future.

The District has an active program of fire hazard mitigation that involves disking, mowing, brush removal, prescribed burning, livestock grazing and other measures. Table 5-11 identifies the cost and scope of work in 2004 which is typical of any year during the five year period.

Figure 5-11 shows the location of these efforts during 2004 on the Pardee and Camanche Watersheds.

Power Fire (2004)

The October 2004 Power Fire near Salt Springs Reservoir was arguably the greatest potential threat to water quality in the Upper Mokelumne River watershed during the update period. Figure 5-10 maps the extent of the fire. A summary of the fire event is presented in Table 5-12 below.

The District performed sampling and analysis of post-fire water quality in the Mokelumne River. Samples were taken between October 2004 and May 2005 to assess the impact of the Power Fire. Grab samples, Hydrolab®, and field turbidity measurements were taken along the North Fork from upstream of the fire near Salt Springs Reservoir down to the Pardee Outlet Tower.

Parameters showing the greatest increase were conductivity, TDS, calcium, silicon, aluminum, and iron. The highest turbidity measurement made by the District was 16 NTU measured just downstream of the fire area at PG&E's Tiger Creek afterbay. This sample was taken less than a week after the fire and following a very light rain. Flow in the river was very low at this time so the suspended solids loading into Pardee Reservoir was insignificant. At the Highway 49 Bridge, a routine sampling point for the District 27 miles downstream of the Power Fire boundary, concentrations of potential contaminants in post-fire samples were found to be within their baseline annual ranges. Much higher turbidities were found in tributaries adjacent to highly burned areas that were sampled by Forest Service staff, as discussed in the Final Environmental Impact Statement (FEIS) summary below.

The District's post-fire water quality analysis concluded that "no significant measurable water quality effects were observed at the outlet tower of Pardee Reservoir." It was noted that weather conditions were favorable for water quality following the Power Fire. For example, a cold storm in early November covered burned areas above 4,500 feet in snow. Water quality samples taken in April and May, when river flows were high from snowmelt, showed that loadings of contaminants to Pardee Reservoir remained low.

Recommendations from the water quality report include close monitoring of water quality beginning at the end of summer 2005. Burned area rehabilitation includes salvage logging, restoring roads, and leaving snags and slash cover in the areas to be treated. However, only half of the burn area is addressed in the Power Fire Restoration, and significant areas will not undergo treatment. Over the next few year, there is still potential for heavy sediment loading following a storm due to land disturbance from salvage logging and the lack of ground cover.

Power Fire Restoration - Final Environmental Impact Statement

Appendix E contains water-quality related portions of the FEIS for the Power Fire Restoration. About 650,000 gallons of fire retardants were used including: Phos-chek WD881 (mixture of surfactants, foam stabilizers and solvents including hexylene glycol) and Fire-trol LCA-R (ammonium phosphate, clay thickener and corrosion inhibitor), both can be toxic to aquatic species if applied directly or drifted into riparian areas. However, their concentrations, typically 0.1 to 1.0 percent, and 20 percent, respectively, decrease quickly downstream from the site of application. Formerly, many fire retardants used compounds which resulted in byproducts containing ferrous cyanide. But in March 2000, California Department of Forestry and Fire Protection (CDF) suspended use of certain fire retardant chemicals which have been shown to release unacceptable levels of cyanide into the environment.

This document describes the burn site, as well as the proposed treatment of approximately half of the burned area where the fire reached moderate to high intensities. In these areas, the fire resulted in high rates of erosion, sedimentation, and destruction of habitat. The burn-area treatments will mitigate impact to soil, water quality, and wildlife, and ensure the remaining woody debris does not contribute to a future fire hazard over the short term.

The FEIS also describes the potential impacts to water quality. Turbidity samples taken in the highly burned watersheds show values over 100 NTU following storm events in December 2004. However, measurements between storm events and during storm events show minor changes in conductivity and pH. This suggests that large increases in metals, salts, and dissolved ions in streams have not occurred (FEIS p. 141-143). Published documents showed that the amount of sediment delivered to streams declines sharply within three years after the fire. (FEIS pp. 144).

The Proposed Action in the FEIS permitted salvage logging in certain burned areas by tractor, skyline, and helicopter. For this alternative, short-term increase of sediment delivery to streams in burned watershed were almost the same as the No Action alternative (FEIS, pp. 150). Downstream of the burned area, water quality may be impacted for the next several years during and immediately after "large storm events" defined as greater than 4.3 inches of rain in 24 hours (50% return interval) (FEIS pp 159).

Recreation opportunities were affected by the fire, including nine campsites, many hiking trails, and over 200 miles of OHV routes. However, the fire and the restoration projects have opened new clearings, skid trails, and haul roads, which historically have been subject to illegal OHV activity. The trails and erosion caused by this activity can have lasting water quality impacts.

Logging

Logging is the major land use activity in all of the sub-watersheds except for the mainstem of the Mokelumne River. The main water quality concerns associated with logging are increased turbidity and nutrient loading from eroded soils. The previous MRWSS's described causes of erosion and the cumulative watershed impacts associated with logging practices. A study was cited that had shown as much as 20 percent increased water yields in the Middle and South Fork Watersheds due to historic logging practices (MRWSS 2000, pp 5-107). Recently, illegal OHV use of logging roads has become a growing concern, as mentioned in sections on Recreation and Fire and Fuels Management.

Logging on the Eldorado and Stanislaus National Forests has been curtailed compared to previous decades. For the Stanislaus National Forest, for example, the amount of timber in the Mokelumne River watershed sold from 1990-1994 was 18.5 million board feet. This decreased to 10.2 million board feet from 1995-1999, and 7.4 million in this update period. The Sierra National Forest Plan Amendment (SNFPA) spotted owl guidelines published in 2001 outlined very restrictive procedures for determining which stands could be harvested. The subsequent revised SNFPA (2004) was much less restrictive, but still decreased overall activity, especially around Riparian Conservation Areas (RCAs) and Protected Activity Centers (PACs) that provide habitat for protected species. Since the 90's, the focus has been on understory removal of trees less than 30 inches in diameter. Recent budgetary constraints have left limited funds for planning timber harvesting projects. Hazard-removal of stands near urban interfaces and roads the given highest priority, as directed by the SNFPA 2004. Table 5-13 shows timber harvests in the update period on National Forest Land. These projects consist of thinning understory growth in the North and Middle Forks of the Mokelumne River.

On private lands, the California Department of Forestry and Fire Protection is responsible for enforcing the regulations of the California Forest Practice Act. The regulations require submittal and advance approval of Timber Harvest Plans (THPs) for all significant harvesting efforts for each three-year time segment.

SPI is the largest current private landowner and timber harvester, operating on both its own lands, USFS lands, and other private lands in the Upper Mokelumne River Watershed. Timber harvest plans filed with CDF are shown on Table 5-14 for the update period, and Figure 5-15 show corresponding areas by year. In the 10-year period since 1995 the District has been notified of proposed THPs in the Upper Mokelumne River Watershed totaling 63,065 acres (17% of watershed area). The great majority of these THPs were submitted by SPI who owns more than 80,000 acres of the 368,000 acres in the watershed. A major change in SPI's harvesting methods during this period was the shift to mechanical logging, whereby trees are felled by mechanical means, then skidded tree-length to a log landing and bucked to logs there. The benefits of this are that in areas where no other slash treatment is proposed, there is generally less logging slash on the ground, and there are many benefits in terms of preventing and controlling wildfires

PG&E maintains an active timber management program that is managed by a staff of registered professional foresters. As part of the timber management program, there are ongoing timber harvest plans on many of the properties proposed for ownership transfer under Project 137. As required by state regulation, PG&E has filed timber harvest plans with the California Department of Forestry for the specific timber areas.

Timber harvesting activities are believed to be responsible for the release of several constituents of concern including sediments, nutrients and total coliform bacteria. While the impacts of individual THPs may not be significant, the cumulative impacts of numerous operations throughout the watershed are considered significant.

Pesticides

The Watershed Sanitary Survey Guidance manual states that "at present time there is no known usable data for the largest volume of pesticide/ herbicide used, i.e. over -the-counter sales to individuals." In the Mokelumne basin, the denser population areas are also closer to Pardee Reservoir, so there is less opportunity for attenuation of the pollutants. However, as described in Section 4, analysis of water quality monitoring in Pardee Reservoir has shown that residual pesticides have not historically been a pollutant of concern. Data was available from the National Forest Service, County Agricultural Commissioners, EBMUD, PG&E, and Caltrans.

National Forests

Over the last 10 years, almost all of the Stanislaus National Forest pesticide applications have consisted of glyphosate (active ingredient in Roundup). Stanislaus National Forest uses pesticides mainly for reforestation, to keep down competing brush and bear clover, and to promote the growth of production timber. The only major treatments in the update period consisted of approximately 120 acres treated each year in 2001 and 2002 as part of revegetation projects. In Eldorado National Forest, use of pesticides in recent years has been predominantly for control of star thistle and other noxious weeds. Decreases in timber harvesting, and the shift towards removal of smaller trees with less clear-cutting have resulted in much less pesticide use for reforestation. Procedures for proper pesticide application that apply to National Forests are outlined in the USDA Water Quality Management for National Forest System Lands in California, 2000. Both Eldorado and Stanislaus National Forests submit monthly use reports to the state, and annual reports to the federal government.

Non-federal Lands

County Agricultural Commissioners have jurisdiction over pesticides applied on non-federal lands. In Amador County, the main user of pesticides is SPI, which applies herbicides for treatment of regrowth sites. Quantities of pesticides used by SPI were obtained from Amador County and summarized in Table 5-15. SPI has BMPs for ground application of pesticides that include maintaining a 150-foot buffer from flowing domestic water supplies, no rinsing of equipment within 200 feet of any watercourse, no spraying when wind speeds exceed ten miles per hour, and the completion of written recommendation from a Licensed Pest Control Advisor for all herbicide applications. Calaveras County has both agriculture and forestry use of pesticides, as summarized in Table 5-16. The Agricultural Commissioner's staff verifies compliance with pesticide laws by periodic inspections of pesticide applications, mixing and loading operations, employee headquarters, and pesticide storage facilities.

PG&E

In the update period, PG&E typically applied Oust, Telar, and Diuron for pre-emergent treatments. Use of Diuron was discontinued in 2004. Post-emergent pesticide use includes Garlon, Roundup, Accord, Stalker and Transline. A total of 10-15 acres around PG&E facilities (equipment yards, flumes, dam faces) are treated annually with pre- and post- emergents. Total quantities by PG&E applied vary from year to year, because rights-of-way are treated every 3 to 5 years, and plantations are treated 1-3 times in the 60 year growing cycle. PG&E utilizes integrated vegetation management (IVM) techniques to select strategies that will minimize vegetation management, whether mechanical, chemical, or biological. License Condition No. 17 of PG&E's Project 137 requires the development of a specific plan for control of noxious weeds on National Forest lands and states that pesticide applications will require appropriate environmental documentation (NEPA).

Caltrans

Caltrans District 10 applies pesticides along portions of State Highway (88, 26, 4,49) in the Upper Mokelumne River Watershed for weed abatement and fire control. The dirt shoulders of paved highways in both directions are sprayed in bands of 4 feet to 8 feet. Roundup is applied approximately three times a year from May through October. Approximately once a year, Transline is also applied to control yellow star thistle, and Pathfinder is used for stump treatments. Near waterways, Aquamaster is used instead of Roundup. Previously used herbicides, as documented in previous MRWSS, included Diuron, Surflan, Goal, and Garlon. Caltrans has reduced pesticide use (50% less than 1992) by limiting spraying of pre-emergents to signs and barriers, mowing at optimum times, and applying sub-lethal concentrations of post-emergents to allow for development of bio-barriers to weed growth.

EBMUD

The Mokelumne Watershed and Recreation Division has an Integrated Pest Management (IPM) program to address pest issues in its area of responsibility. Currently there are programs to control pests such as yellow jackets, ground squirrels, and feral pigs, and this control is achieved through mechanical means such as trapping, and in some cases, shooting by federal trappers. Voles are controlled with zinc phosphide, a rodenticide to prevent destruction of bird habitat at the Camanche Hill Hunting Preserve. Other pests are controlled by both mechanical and/or chemical means. Such pests include insects around facilities/structures, and noxious weeds such as Yellow Star Thistle. Herbicides currently approved for use by the District's IPM Committee in the Mokelumne Division are Roundup Pro, Garlon 4, and Transline. The Mokelumne Division has implemented a Best Management Practice with regard to herbicide application and use as described in Section 6

Unauthorized Activities

The previous MRWSS described illegal dumping activities and their potential impact on water quality. Personal communication with Amador and Calaveras County staff indicate that illegal dumping has become an increasing problem with the influx of population in the update period. The worst areas are typically roadsides outside official dumps sites, such as Defender Grade Road near Pioneer in Amador County. On these roads, illegal dumping consists mostly of construction waste, large appliances, and other inert materials. There are no official dumps within Calaveras County, though there is a transfer station in Wilseyville.

When potentially hazardous substances are found, the County Sheriff, CDF, or OES is notified. Calaveras County has a hazmat team that responds to incidents in both Amador and Calaveras Counties. Additional information regarding petroleum products and other chemicals can be found under the "Hazardous Materials" discussion of this Section 5. As mentioned in the 2000

MRWSS, it is likely that illegal dumping increase as the population increases and as landfill and garbage disposal rates rise. Given the size of the watershed it is expected to be difficult to minimize the increase, except on those lands directly owned and managed by the District.

Camanche Watershed

The Camanche Watershed is defined here as the 49 square-mile area that drains to Camanche Reservoir, downstream of Pardee Dam. As described in Section 2, Camanche Reservoir is immediately downstream of Pardee Reservoir, and therefore contaminant sources in the Upper Mokelumne River Watershed, discussed in the previous section, can affect Camanche Reservoir water quality. This section addresses additional land uses and activities in the Camanche Watershed only.

Many of the details pertaining to the relationships between the potential contaminant sources (land uses and activities) and the five water quality parameter groups have been thoroughly addressed in the Upper Mokelumne River Watershed section and in previous MRWSS (1995, 2000). Therefore, they will not be discussed here to the same level of detail. Below is the list of potential contaminant sources which have the greatest potential for impacting water quality.

- EBMUD Facilities
- Water Resources Development
- Sanitation Facilities
  Hazardous Materials
- Urban Area Runoff
- Rural Area Runoff
- Utilities
- Transportation Corridors
- Hydroelectric Power
- Agriculture
- Wildlife and Livestock
- Recreation/ Public Access
- Mines
- Geologic Hazards
- Fires and Fuels management
- Logging
  Pesticides
- Unauthorized Activities

Most facilities and corresponding activities within the Camanche Watershed are associated with the District facilities. Therefore, most of the potential contaminant sources identified for Camanche Watershed will be documented under the category of EBMUD Facilities. Sanitation facilities, urban area runoff, rural area runoff, utilities - hydroelectric power, and recreation are included under the category of EBMUD Facilities.

EBMUD Facilities

District facilities within the Camanche Watershed include the Camanche Dam and dike system, Camanche hydroelectric facilities, Camanche South Shore Recreation Area, Camanche North

Shore Recreation Area, Pardee Reservoir afterbay and spillway, and the District's Watershed Headquarters Administration Building and Maintenance Yard.

Camanche South Shore Recreation Area

The Camanche South Shore Recreation Area is located in a rural area on the south shore of Camanche Reservoir in Calaveras County (Figure 5-12). The only road to the facility is Wade Lane and there are no major businesses, care facilities, highways, hospitals, or schools in the immediate area. The facility is surrounded by the reservoir on three sides and the area to the east is a residential area.

The Camanche South Shore Recreation Area encompasses approximately 1,740 acres. Approximately 140 acres are developed which include a marina with fueling facilities, recreational vehicles sites, rental cottages, a water and wastewater plant, and a maintenance yard. Table 5-17 summarizes the recreation facilities located in this recreation area. The remaining acreage is undeveloped watershed. Except for the water and wastewater treatment plants, ranger station, and maintenance yard, which are maintained and operated by the District, the facilities are maintained and operated by the concessionaire, Camanche Recreation Company.

Recreation. Recreational activities include boating, fishing, picnicking, camping, and hiking. In 2004, the Camanche South Shore Recreation Area served 70 permanent residences, 8 permanent travel trailers and an average of 607 visitors per day. In 2004, an average of 22 boats per day was observed with a peak monthly usage of 1,791 boats (July 2004). On July 4, 2004 the total number of campers and visitors peaked at 2,561. Table 5-18 presents the record of visitor use at Camanche South Shore Recreation Area for the update period. Average annual visitor use for the update period was 215,000, which is a 9% increase over the previous five-year period.

In August 2003, a boat sank near Camanche South Shore and approximately two gallons of oil and gasoline were released. The discharge was contained by booms and removed with absorbents.

Water Supply. Drinking water for the residents and visitors is provided by the District's Camanche South Shore WTP that draws its supply from Camanche Reservoir, described in Section 2.

Hazardous Materials Storage. The WTP for the Camanche South Shore Recreation Area uses a combined coagulant/polymer, and calcium hypochlorite to treat the water prior to distribution. The coagulant/polymer is stored in the delivered 55-gallon containers with spill containment for each container. Any spills are contained locally in the WTP building. An inventory of hazardous materials stored on site is performed annually and reported in the Camanche South Shore Environmental Emergency Response and Release Prevention Plan (ER Plan). A table of hazardous materials, as listed in the 2004 ER Plan is reproduced in Appendix C.

Sanitation Facilities. Wastewater disposal and treatment services are provided by a sewer collection system and wastewater treatment facilities which include three ponds: two with mechanical aeration, and one for final disposal by evaporation and percolation. The final pond is located approximately 4,000 feet from the intake of the reservoir. No overflows have occurred within the past five years. Chemical toilets are used at Camanche South Shore Recreation Area to augment the sanitation facilities during the peak visitor season. An abandoned solid disposal site is located adjacent to the wastewater treatment ponds. Appendix D provides a summary of the compliance monitoring required for these facilities.

As discussed in the 2000 MRWSS, the Camanche South Shore Solid Waste Facility is owned by the District and was operated between 1967 and 1984. It accepted household waste from the South Shore Recreation Area. In July 1987, the RWQCB issued a Waste Discharge Requirement for facility closure, groundwater monitoring, and reporting on closure activities. In 1997, the RWQCB indicated that no significant threat to water quality remained and rescinded the discharge requirement.

Table 5-19 shows sewer overflows for Camanche South Shore. In the update period, most overflows occurred in the mobile home park, with a few more incidents in campground restrooms. On average, about five incidents per year occurred during the update period. The most substantial sewage release was a 400-gallon overflow in 2001. The spill was removed by vacuum pump and discharged in a wastewater pond. Since the MRWSS Update 2000, new lift stations and grease trap, and sewer piping have been installed, and an inventory and assessment of the wastewater collection system has been completed, allowing prioritization of maintenance projects to minimize future sewer overflows.

Camanche North Shore Recreation Area

The Camanche North Shore Recreation Area is located in a rural area on the north shore of Camanche Reservoir in Amador County (Figure 5-13). The only roads into the area are Camanche North Parkway and Camanche Road. There are no major businesses, care facilities, highways, hospitals, or schools in the immediate area other than a few stores and restaurants at Lake Camanche Village three miles away. The area to the north is a residential area. The area to the west and east is predominantly undeveloped watershed and agricultural land.

The Camanche North Shore Recreation Area encompasses approximately 535 acres. Approximately 100 acres of the parcel is developed and includes a marina with fueling and boat cleaning facilities, paved boat launch, fish cleaning stations, a restaurant, general store, snack bars, public restrooms, day-use picnic areas, campgrounds, laundry facilities, two mobile home parks, a water treatment plant, a wastewater treatment plant, a park office, an Amador County Sheriff office, a maintenance yard, and several large parking areas. Table 5-17 summarizes the recreation facilities that can be found in the Camanche North Shore Recreation Area. The remaining acreage is undeveloped watershed. Except for the water and wastewater treatment plants, ranger and sheriff stations, and maintenance yard, which are maintained and operated by EBMUD, the facilities are maintained and operated by the concessionaire, Camanche Recreation Company.

Recreation Recreational activities include boating, fishing, picnicking, camping, and hiking. In 2004, the Camanche North Shore Recreation Area served 128 permanent residences and an average of 659 visitors per day. In 2004, an average of 40 boats per day was observed with a peak monthly usage of 2989 boats (July 2004). On July 4, 2004, total number of campers and visitors peaked at 2,322. Table 5-20 presents the record of visitor use at Camanche North Shore Recreation Area for the period 2000- 2004. Average annual visitor use for the update period was 207,000, which is an 18% increase over the previous five-year period.

In May 2000, a boat burned and sank in 3-4 feet of water near the Camanche North Shore Recreation area. The boat was retrieved and less than 5 gallons fuel was released. In June 2003, a sunken jet ski produced about five gallons of gasoline. For both these incidents, EBMUD rangers deployed an absorbent boom and swept the affected area.

Water Supply. Three wells provide potable and non-potable water to the Camanche North Shore Recreation Area facilities. The District's potable water treatment facilities provide drinking water to 211 service connections (155 general and residents, 56 seasonal). Manganese greensand filters and chlorination are used to reduce the iron and manganese in the raw water supply.

Hazardous Material Storage Calcium hypochlorite is stored in dry 50-pound pails and potassium permanganate used during treatment is stored in 200-gallon container. An inventory of hazardous materials stored on site is performed annually and reported in the Camanche North Shore Environmental Emergency Response and Release Prevention Plan (ER Plan). A table of hazardous materials, as listed in the 2004 ER Plan is reproduced in Appendix C.

Urban/Rural Runoff. As reported in the 2000 MRWSS, four underground storage tanks were removed from the Camanche North Shore Recreation Area Marina Store in April 1997. During the removal activities, hydrocarbon contamination was discovered in the old piping run to the North Shore Marina. Subsequent soil excavation took place, along with confirmation sampling, which indicated that some contaminated soil was left in place. In November 1999, two groundwater monitoring wells were installed at the site. Two site characterizations were performed: one in 2000, and the other in 2004. In 2004, free product was observed in one of the wells, and in October 2005, additional soil and groundwater sampling was performed. The data that has been collected indicate that the contamination is highly localized, there is no threat to reservoir water quality, and natural attenuation is an acceptable remediation alternative. Because of the free product, it's likely that the quarterly monitoring will last well into 2007.

Sanitation Facilities. Wastewater treatment and disposal services are provided by a combination of a sewer collection system, septic system and spray fields. The District continues to study the feasibility of a Joint Regional Wastewater Treatment Facility with Amador Water Agency. The current wastewater treatment plant which consists of six ponds: two for aeration, one for extended aeration, two for winter storage and one for polishing/equalization. Appendix D provides an overview of compliance monitoring required for these wastewater facilities. After treatment, spray irrigation is practiced over a five-acre area. In 2004, the nozzles on the sprinklers feeding the spray area were changed to a fogger-type, which increased the evaporation disposal from 10,000 gal/day to 50,000 gal/day and decreased potential for runoff. The spray area is contained from runoff, with diversion back into the polishing pond. During this update period, a mechanical spritzer was installed in the polishing pond to increase evaporation. The wastewater treatment plant typically treats about 30,000 gallons per day. Chemical toilets are used at Camanche North Shore Recreation Area to augment the sanitation facilities during the peak visitor season.

Table 5-21 shows sewer overflows for Camanche North Shore. The records show that on average, about two incidents per year occurred during the update period. The most substantial spill was a 7,100 gallon release that occurred during pipeline repair work. The spill was contained in the trench, removed by vacuum pump and discharged in a wastewater pond. Since the MRWSS Update 2000, an inventory and assessment of the wastewater collection system has been completed, allowing prioritization of maintenance projects to minimize future sewer overflows.

Watershed Headquarters and Maintenance Yard – In addition to the Ranger Stations located at the Camanche South Shore and North Shore Recreation Areas, the District operates an office building that serves as the headquarters for operations of the District's Mokelumne Watershed and Recreation Division. Wastewater treatment and disposal is provided on-site by a septic tanks and leach field. The District also operates a maintenance yard that houses equipment and supplies for the District's Pardee and Camanche facilities.

Water Resources Development

At this writing, water resources development projects are not identified for the Camanche Watershed. All the current development projects are targeted for the Upper Mokelumne River Watershed. In particular, is the transfer of ownership of the extensive PG&E hydroelectric facilities (Project 137) which are associated with Upper Mokelumne River Watershed. Integrated watershed management between the Pardee and Camanche watersheds will be critical to insure any negative impacts detected at Camanche Reservoir are minimized.

Sanitation Facilities

Sanitation facilities and sewer overflows within the Camanche Watershed are associated with the District's facilities and are discussed above.

Hazardous Materials

Hazardous materials stored associated with the District's facilities and are discussed above. Records from the District's Regulatory Compliance Office and Calaveras County OES (which responds to Amador and Calaveras county emergencies) show several incidents per year involving abandoned drug lab chemicals and solvents being recovered around the cities of Wallace and Valley Springs. The materials are dumped in ponds and along roadsides. Typical chemicals found during these incidents were discussed in the Upper Mokelumne Watershed section.

Urban Area Runoff

Urban land uses include residential, commercial, and public facilities. The potential contaminants in the runoff from these facilities include metals, solvents, oil, grease, hydrocarbons, and pesticides from landscaping activities, coliform bacteria, and sediments from construction. Urban area runoff within Camanche Watershed is associated with the District's facilities as discussed above.

Rural Area Runoff

For the purposes of this study, rural area runoff is focused on potential contaminant sources associated with rural residences. Rural residences are generally dispersed over large areas, often on large parcels of land -- one house per 100 acres. The potential water quality issues associated with rural residences are similar to those for urban residential areas. One difference for the rural residences is the use of septic systems instead of sewers for waste collection and treatment. Rural area runoff within Camanche Watershed is associated with the District's facilities as discussed above.

Utilities - Hydroelectric Power

Hydroelectric power generation occurs at Camanche Dam and is part of the District's facilities as mentioned above. Some water from the turbine stock seal area and the turbine head cover pump is collected in the wastewater sump located within the powerhouse. Penstock water flowing through the wear seals, leaking turbine seals and the monthly wash down water used to generate between 0.05 - 0.10 million gallons per day (MGD) of wastewater. The amount has been reduced to approximately 0.014 MGD with the District's various source control efforts.

The wastewater treatment process consists of a collection sump equipped with an oil belt skimmer located within the powerhouse. Oil that is recovered by the belt skimmer is recycled and reused at the powerhouse. The water within the sump is pumped to a 20,000-gallon retention pond (located outside of the powerhouse). The retention pond is equipped with a rope oil skimmer, and through a series of baffles, recirculates the surface skimmings to an aboveground storage tank. The oil is removed from the site, via manifest, as recycled waste oil every 90 days. The effluent from the pond currently flows by gravity to the Mokelumne River under an existing permit (NPDES No. CA0082040). A standby earthen basin at a capacity of 85,000 gallons is located adjacent to the sump and is used when the retention pond undergoes scheduled maintenance.

The District is proposing to redirect the oil separation pond's effluent to a 750,000 gal holding/infiltration pond to be located on the northwestern corner of the Camanche Warehouse lay down area, approximately 300 feet northwest from the existing discharge point into the river. Final disposal of the discharge will be through evaporation and ground infiltration.

Transportation Corridors

The primary concerns associated with transportation corridors are the automotive related contaminants in surface runoff from roads and parking areas and herbicide application. While no major transportation corridors traverse Camanche Watershed, several secondary roads exist which primarily service the District's Camanche South Shore and Camanche North Shore recreation facilities. These roads are highlighted under the EBMUD Facilities section above.

Agriculture

No agricultural activities are currently present within the Camanche Watershed.

Wildlife and Livestock

While livestock are the greatest contributor of animal waste in the Camanche Watershed, birds and mammals can introduce microorganisms into Camanche Reservoir and its tributaries through direct contact or animal waste. Deer, bobcats, opossums, beavers, muskrats, skunks, coyotes, California ground and grey squirrels, gulls and geese, which are common species occurring in the Camanche Watershed, are associated with microbial contamination of drinking water supplies. Significant pathogens associated with animal waste include *Cryptosporidium parvum, Giardia lamblia, Salmonella, E. coli* and avian influenza.

Cattle grazing occurs throughout the Camanche Watershed basin and is permitted on portions of the District-owned lands surrounding Camanche Reservoir. The District's grazing policies were described in the Upper Mokelumne Watershed section. Grazing occurs on approximately 5,000 acres of land in the Camanche Watershed. Table 5-22 lists the active grazing leases and the total AUMs. Figure 5-14 shows the location of each allotment.

Recreation

Recreation activities occur within the Camanche Watershed and are associated with the District's facilities at Camanche South Shore and Camanche North Shore Recreation Areas, and are discussed under "EBMUD Facilities." As discussed previously, numerous activities are included under the heading of recreation. A variety of water quality concerns are associated with recreation and vary depending upon the specific activity.

Mines

Only one mine, Penn Mine, in the Camanche Watershed has been identified as a potential contaminant source, though there are other mines. Penn Mine was a copper and zinc mine abandoned in 1950. Background information on Penn Mine can be found in the 2000 MRWSS. In May 1997, the District and the RWQCB initiated the Penn Mine Environmental Restoration Project to implement site restoration work at Penn Mine, under the oversight of the USEPA. Approximately 380,000 cubic yards of waste material were excavated and placed in a six-acre landfill. The landfill was constructed with a clay liner and leachate collection system to contain the excavated waste materials. A soil cover was placed over areas disturbed by the waste excavation, which were then revegetated with native grasses and shrubs. Best management practices were employed during and following construction for erosion control and sediment management. Existing diversion channels were removed and surface water was allowed to flow into restored streambeds which were designed to minimize erosion and restore habitat. Construction activity for the Penn Mine Environmental Restoration Project was completed in December 1999. Three years of post-restoration monitoring of the Penn Mine facilities were conducted to ascertain the effectiveness of this environmental restoration project in returning the site to 'pre-mining' condition. Based on the results of this monitoring, the project was deemed successful and requirements for post-restoration monitoring were eliminated by the USEPA. The District continues monthly monitoring of surface water runoff from the site for copper, zinc, pH and TDS. In addition, the maintenance inspections of the landfill and site stability are conducted on a regular basis

Geologic Hazards

Soil erosion is the primary geologic hazard in Camanche Watershed. Suspended sediment in a water supply reservoir can cause turbidity problems. Phosphorus and nitrogen, which associate with sediments, promotes algae blooms and reservoir increases in biological oxygen demand during the summer. In 1997, 50,000 cubic yards of material eroded out of Mexican Gulch into the Mokelumne River below Pardee Dam. A contractor removed the material with mining equipment.

While specific geologic hazards are not identified for Camanche Watershed, heavy rainfall can lead to erosion from surface runoff. The risk to the Camanche Reservoir is greatest when erosion occurs near the reservoir itself, since small rainfall events can transport sediment over a short distance. Large storms can transport sediment from throughout the watershed. Erosion is most likely to occur where the land has been disturbed, exposing bare soil. Road cuts on steep slopes are a major source of sediment erosion. Landslides, fires, or disturbances by animals are other modes by which the erosion risk increases.

Fire and Fuels Management

Table 5-23 lists fires that occurred in the update period in the Mainstem and Camanche Watershed. Only fires greater than 0.5 acres were included. As discussed in the previous section, the Power Fire in October of 2004 posed a major concern for water quality in the update period. In the Camanche Watershed, a 2,200-acre fire occurred in June 2001 in the northern portion of the Camanche Watershed between Highway 88 and Camanche Reservoir, but there were no known water quality impacts.

As noted in the 2000 MRWSS, in lower, less forested portions of the Sierra foothills, human-caused wildfires may pose a more significant threat than lightning strikes. Fire created by activities along the roadside or trails, such as discarded smoking materials, catalytic converters, or vehicle fires, could have significant negative impacts on the water quality of Camanche Reservoir resulting from increased erosion during rainfall events.

Logging

The District has observed the formation of hydrogen sulfide in Camanche Reservoir during summer and fall seasons when the lake is thermally stratified. To offset this impact, the District has installed a hypolimnetic oxygenation system to keep releases from Camanche Reservoir free of hydrogen sulfide. A secondary system was also installed by the District to treat the hatchery influent water and neutralize hydrogen sulfide. This potassium permanganate treatment system is in place and would only be used if the hypolimnetic oxygenation system were to malfunction.

Logging, due to its overwhelming land use position when compared to all other uses, is the only major land use capable of producing the increases in nitrates observed in Camanche Reservoir. While logging is conducted in the Upper Mokelumne River Watershed, the Pardee and Camanche reservoirs are operated in concert, thereby allowing the impacts of logging to be transferred into the Camanche Reservoir. Other land use changes, in either the Pardee or Camanche Watershed, are too restricted in acreage to account for the observed water quality problems. On the other hand, only very small increases in nutrient releases per unit area would be needed from the large acreage of logged lands in Upper Mokelumne River Watershed to explain the increase. A land use analysis indicates that production forest lands in the Upper Mokelumne River Watershed account for 121,000 acres, or 32.9 percent of the 368,000 acres in this watershed. After deducting undisturbed open space (241,350 acres, 65.6 percent), only 1.5 percent of the land is left for all other uses, including residential and commercial.

Unauthorized Activities

Unauthorized activities within the Camanche Watershed can contribute to a myriad of contaminants entering the Mokelumne River and ultimately Camanche Reservoir. Roadways leading into or through the watershed increase the potential for unauthorized activities such as illegal dumping. Illegal dumping and trespassing may impact reservoir water quality by introducing contaminants from materials dropped into creeks or the Mokelumne River leading directly into the reservoir. The illegal dumping of household wastes and appliances is a common ongoing problem within watersheds. In addition, commercial dumping (e.g. concrete blocks, creosote logs, tires) has also occurred. Illegal dumping will likely increase as the population increases in surrounding areas and as landfill and garbage disposal rates rise. While it is difficult to stop unauthorized activities, the District can be successful in minimizing these activities on those lands directly owned and managed by the District.

Significance of Potential Contaminant Sources

This section summarizes the various contaminant sources identified previously and their potential for water quality degradation for both the Pardee and Camanche Watershed Areas. The potential for each contaminant source to impact water quality is ranked insignificant, low, medium, and high as shown in Table 5-24. These rankings take into account watershed characteristics (size, slopes, soils, vegetation), type of contaminant, distance to water bodies, and magnitude of source.

In addition, historical records regarding a potential contaminant source may influence a ranking; however, they may be outweighed by the perceived public health risk associated with a water quality parameter. For example, District historical records may not substantiate the potential water quality concerns associated with recreation. However, this does not reduce the potential risk to public health in the event that a recreation-related, water quality contamination event occurs in the future.

In an effort to further highlight the water quality parameters of greatest concern for a specific potential contaminant source, the water quality parameters have been prioritized. This prioritization is based on water quality concerns as they relate to public health and drinking water regulations as well as historical raw water qualities documented in Section Four. The water quality parameter of greatest concern for a specific contaminant source in Table 5-24 is identified in bold type. Below is a general listing of the prioritization assigned to the water quality parameters.

1) Microbiological contaminants with the potential for acute illness;
2) Algae and inorganic compounds which contribute to taste and odor problems;
3) Turbidity (particulates) which provides the transport mechanism for adsorbed contaminants;
4) Total organic carbon which when disinfected, may result in increased DBPs; and
5) Other organic and inorganic compounds which are known or suspected carcinogens, mutagens, or teratogens, or cause acute toxicity.

In determining the potential effects to water quality, microbiological contaminants were considered the highest priority in recognition that they are the parameters targeted by the SWTR watershed sanitary survey requirements and that there may not be currently effective and reliable treatment techniques at the District's WTPs (as they were not designed for this purpose) for controlling Cryptosporidium, the most recently identified pathogen for regulatory control. In addition, the future LT2ESWTR could potentially impact the level of Giardia or Cryptosporidium removal required. Given these reasons, protecting the raw water sources from microbiological contaminants is crucial.

Second priority pertains to algae and inorganic compounds, which may generate T&O incidences. While T&O is an aesthetic concern and not a public health concern, most consumer complaints in the District involve T&O events. Third priority pertains to particulates because of their potential role as a transport mechanism for other adsorbed contaminants. TOC is designated as the fourth priority since high levels can lead to DBP formation in the District's finished water. Fifth priority pertains to other organics and inorganics. While serious public health concerns can be associated with many of these parameters, as discussed under Water Quality Parameters of Concern, historical raw water quality data documented in Section 4 indicate they are at or below detection limits, and, therefore, do not pose any public health concerns for the District.

Several of the potential contaminant sources listed in Table 5-24 were given ratings of insignificant, low or low to medium with regards to their potential for affecting water quality. These sources include: agriculture, transportation corridors, and unauthorized activities.

Below are brief discussions regarding the rationale for assigning the other potential contaminant sources with low to high, medium, and medium to high ratings for impacting water quality. These sources include: sanitation facilities, urban and rural area runoff, EBMUD facilities, utilities - hydroelectric power, wildlife and livestock, recreation, geologic hazards, and fires and fuels management.

Sanitation Facilities

Sanitation facilities include wastewater collection, wastewater treatment, and septic systems. They are classified as having had low to high potential for affecting water quality depending upon proximity to water, watershed characteristics, concentrations of contaminants, and precipitation. During this update period, no spills from wastewater systems were reported for the five community WWTPs on the Upper Mokelumne River watershed. Data from Calaveras County and CPUD and CCWD showed a few failed septic systems on the watershed, but due to low density, containment codes, and distance from water bodies, the potential threat remains low. New development will increase the number of septic systems in the area, though larger new subdivisions will be on sewer or community wastewater systems, As existing systems age, there is a greater likelihood for failure and contamination of water resources.

On the Camanche Watershed, the update period sewage overflow incidents occur on average several times each year in the North and South Shore areas. Records of these events are tracked by the District's Regulatory Compliance office, and show that cleanup efforts following these spills have successfully contained the spills on land and prevented direct introduction to Camanche Reservoir water. However, these events remain a high potential threat to water quality because of their proximity to reservoir.

Urban and Rural Area runoff

Population growth in urban and rural areas continued steadily in Calaveras, Amador, and Alpine Counties, though slower that previously projected for most communities and unincorporated areas. Incorporated cities like Jackson were the exception, with housing development dramatically increasing during the update period. Both the urban (residential/commercial) and rural (residential) area runoff categories received rankings of low to high for potentially affecting source water quality for a variety of contaminants. In general, the potential contaminant sources and corresponding water quality concerns associated with the runoff from each of these areas are similar. However, the magnitude of the rural area water quality concerns is reduced, excluding microbiological parameters, when compared to urban area runoff. This is particularly true herein because the residential component of the rural area is considered to produce the most significant impacts, however, rural areas are sparsely populated with residences dispersed over large areas.

During the update period, a turbidity plume from a construction site in the City of Jackson was documented. This event served as an example of the sediment loadings that could occur from the construction of multiple subdivisions planned in Jackson and in other communities along Highway 88. Of most importance from an urban area runoff standpoint, however, are the microorganisms and organics – Synthetic Organic Carbons, (SOCs), oil and grease, and other hydrocarbons. The potential contaminant sources for the microorganisms are the occasional accidental sewerage overflows. The potential contaminant sources for the organics are the commercial areas and corresponding parking lots. With regards to rural area runoff, microorganisms are of the most concern because the residences are unsewered, and septic system leakage has been shown to be a problem. When comparing these potential contaminant concerns, the microorganisms are of the most importance because they can result in acute health-effects while organics can result in chronic health-effects from long-term exposure. .

EBMUD Facilities

EBMUD facilities (excluding recreation) received a low to high rating. Because these facilities encompass a wide range of land uses and activities, they can potentially contribute a variety of contaminants into the reservoirs. Chemicals are stored onsite, although, containment measures are in place for the treatment related chemicals. Although there are measures to prevent stormwater runoff, leaks, and accidental spills, the risk of water quality impact increases due to the proximity of these facilities to the reservoirs and their tributaries as mentioned in the Sanitary Systems section above. In addition, watershed activities such as road and trail maintenance can cause significant erosion, which can result in higher raw water turbidities and other adsorbed contaminants.

Utilities - Hydroelectric Power

Utilities, specifically hydroelectric power generation received a high rating. Extensive hydroelectric power generation facilities exist throughout the watersheds but predominantly in the Upper Mokelumne River Watershed. These facilities incorporate a complex system of reservoirs, canals, and tunnels, which are proximate to the Mokelumne River and main tributaries. In some cases these facilities are integrated into the main tributaries. Elevated temperatures resulting from hydropower generation have a significant impact on algal growth and corresponding potential T&O events and elevated TOC concentrations. In addition, turbidity and nutrient increases due to erosion related to facility operations impacts water quality.

Wildlife and Livestock

Wildlife and livestock received a medium to high rating. The pathogens (*Giardia lamblia* and *Cryptosporidium parvum*) associated with wildlife and livestock are considered significant health risks because of the impending, stringent, future regulations and the current inability to reliably analyze and treat them, particularly Cryptosporidium. Reduced utilization on National Forest Lands and active range management practices on District's property around Pardee and Camanche Reservoirs reduce potential contamination, but little information is available for lands in the lower portion of the watershed where livestock is grazed on private lands. Erosion caused by livestock can result in higher raw water turbidities and other adsorbed contaminants, and inorganic compounds (nitrogen and phosphorous) associated with wildlife and livestock may impact algal blooms, some of which can cause undesirable T&O.

Recreation

Recreation within the District, SPI, National Forests, Bureau of Land Management, and PG&E lands received a rating of medium to high. New river rafting facilities on the North Fork and Mainstem of the Mokelumne River will increase the amount of public access and potential for contamination. In Pardee Reservoir, current provisions limit recreation and prohibit body contact in Pardee Reservoir in order to protect the District's raw water quality. However, body contact recreation is permitted on Camanche Reservoir under restricted conditions. Visitors using the non-District related facilities enjoy activities that occur proximate to the water bodies or take place on the water bodies. Given the number of visitors and the proximity to water, the potential for degrading water quality increases.

The concern over erosive nature of OHV operation, (e.g., motorcycles, all-terrain vehicles, four-wheel drives, SUVs) has become an issue of increasing concern among Forest Service, Sierra Pacific, and District staff in past few years. The increase in popularity over other ground-based forms of trail recreation (hiking, horseback riding), along with the emphasis on unpaved trails, and the great distances covered make this recreational activity one with the potential to significantly increase erosion control problems.

Geologic Hazards and Fires and Fire Management

Geologic hazards, and fires and fuels management received medium to high ratings because of their potential to impact soil erosion. Water quality data collected from the 2004 Power Fire showed that high turbidities in the tributaries draining burned areas were diluted to annual baseline levels by the time they traveled 30 miles to Pardee Reservoir. Nevertheless, post-fire sampling gave local agencies an idea of the magnitude of suspended solids and inorganic loadings that can ensue following a major fire.

Geologic hazards, such as earthquakes and landslides, and fires are significant causes of elevated erosion risk. While earthquakes, landslides, and fires expose the soil and make it vulnerable to erosion, precipitation is necessary to induce erosion and, in turn, increase turbidity in the water supply. Turbidity, in turn, transports other adsorbed contaminants into the water bodies. In addition, high loads of turbidity transported into the water bodies by runoff from precipitation can cause significant treatment problems. While geologic hazards and major fires are not common occurrences, their resulting impacts can be catastrophic.

FIGURE 5-1 - Pardee Recreation Area

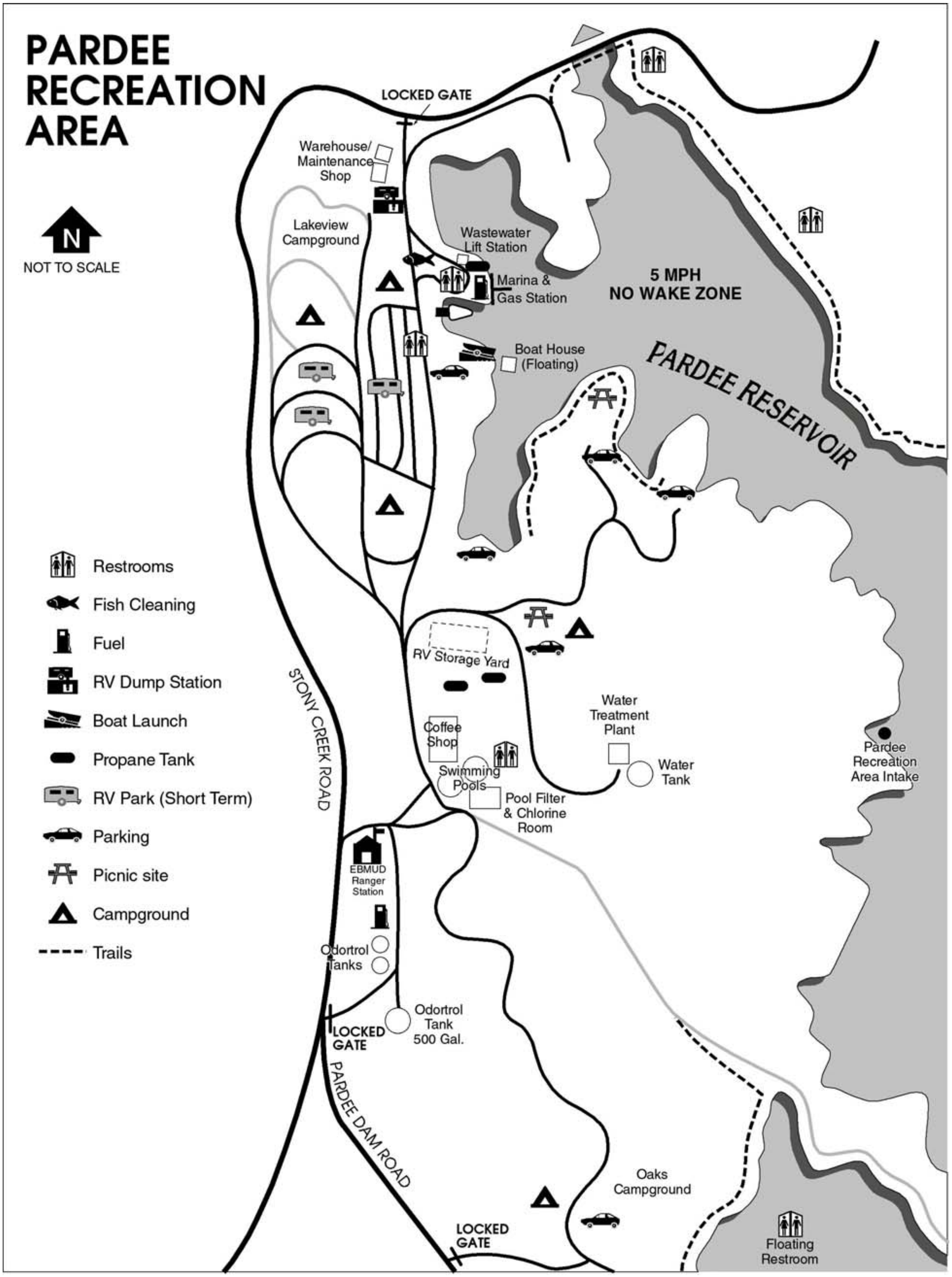
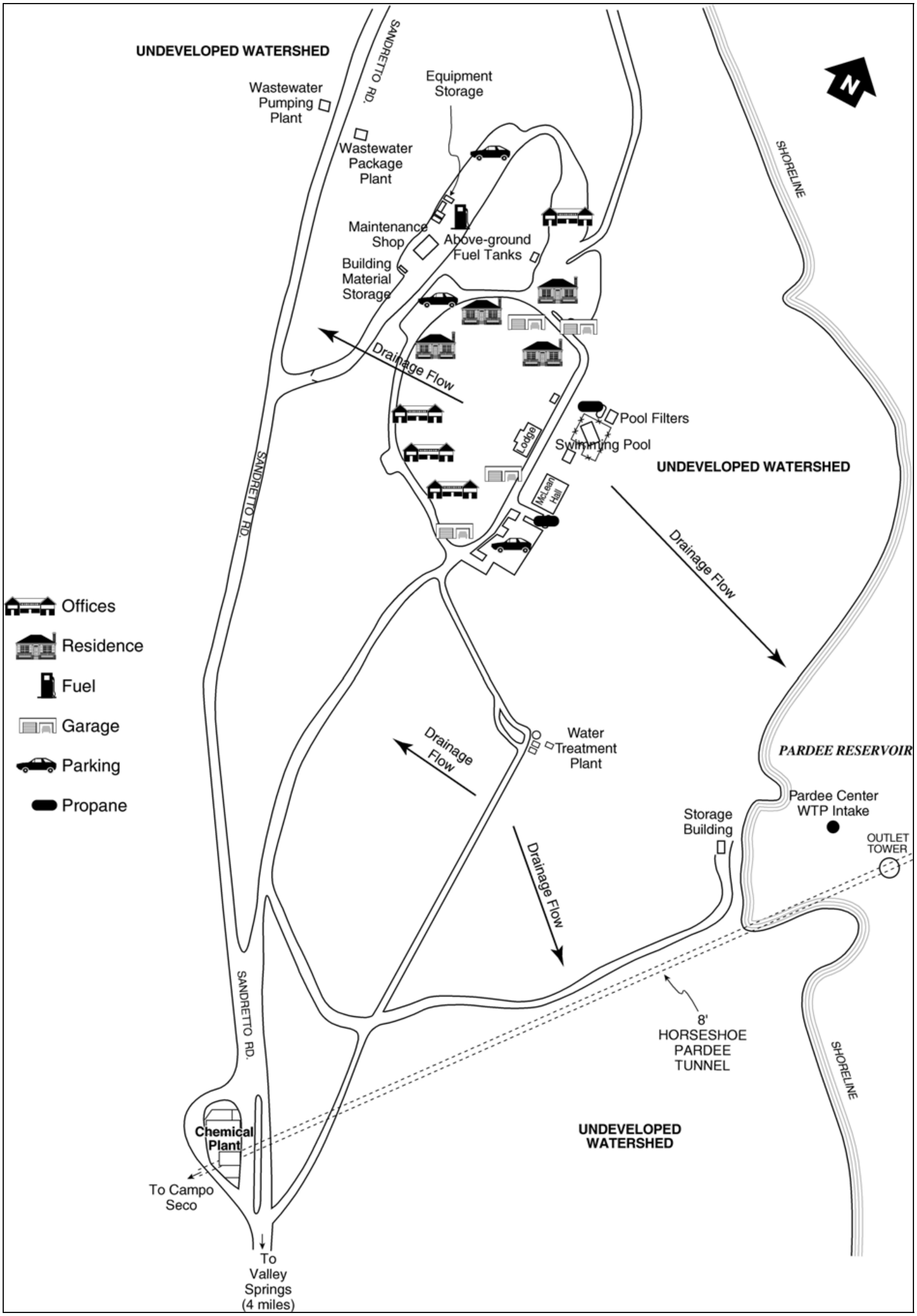
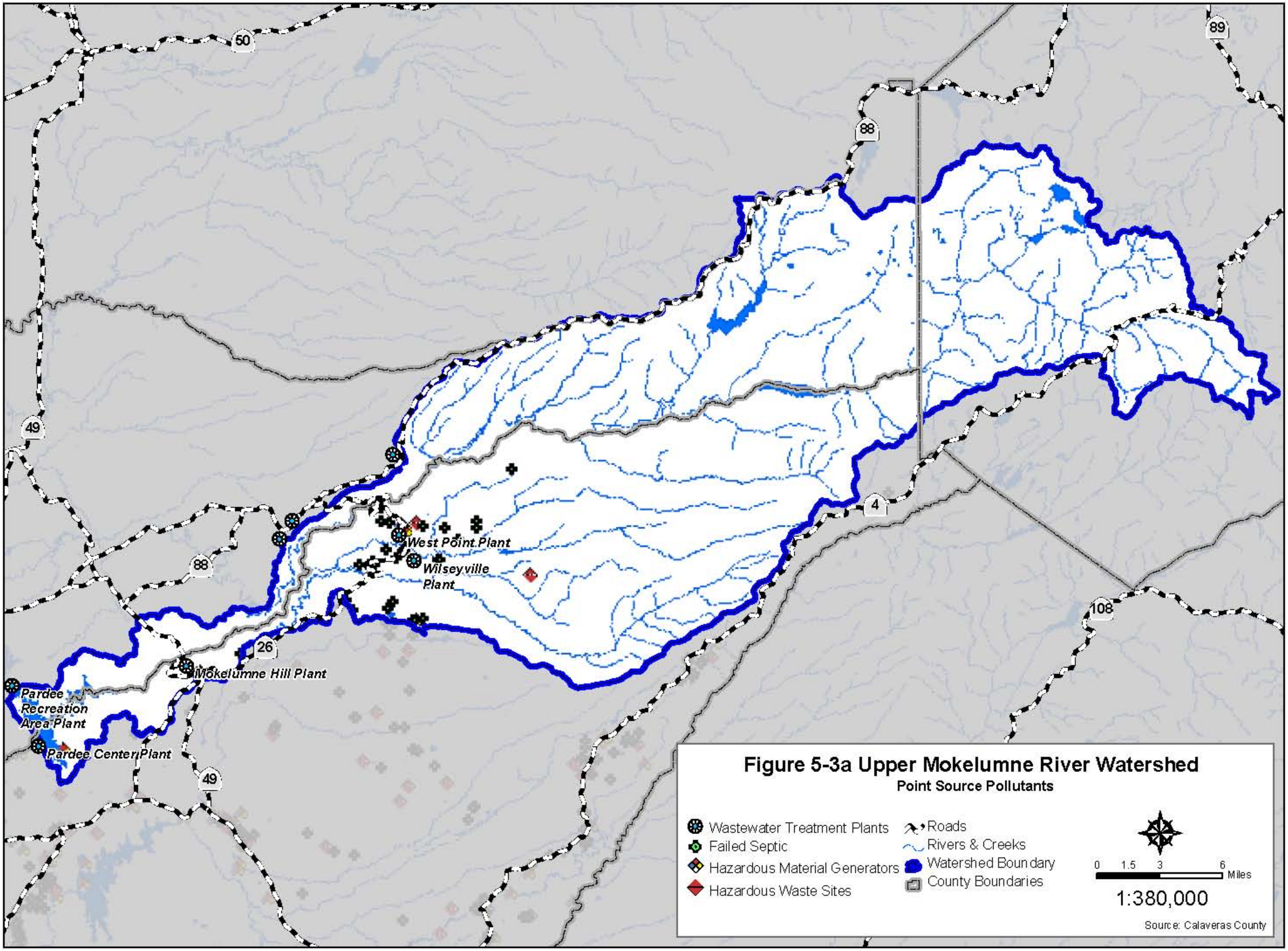
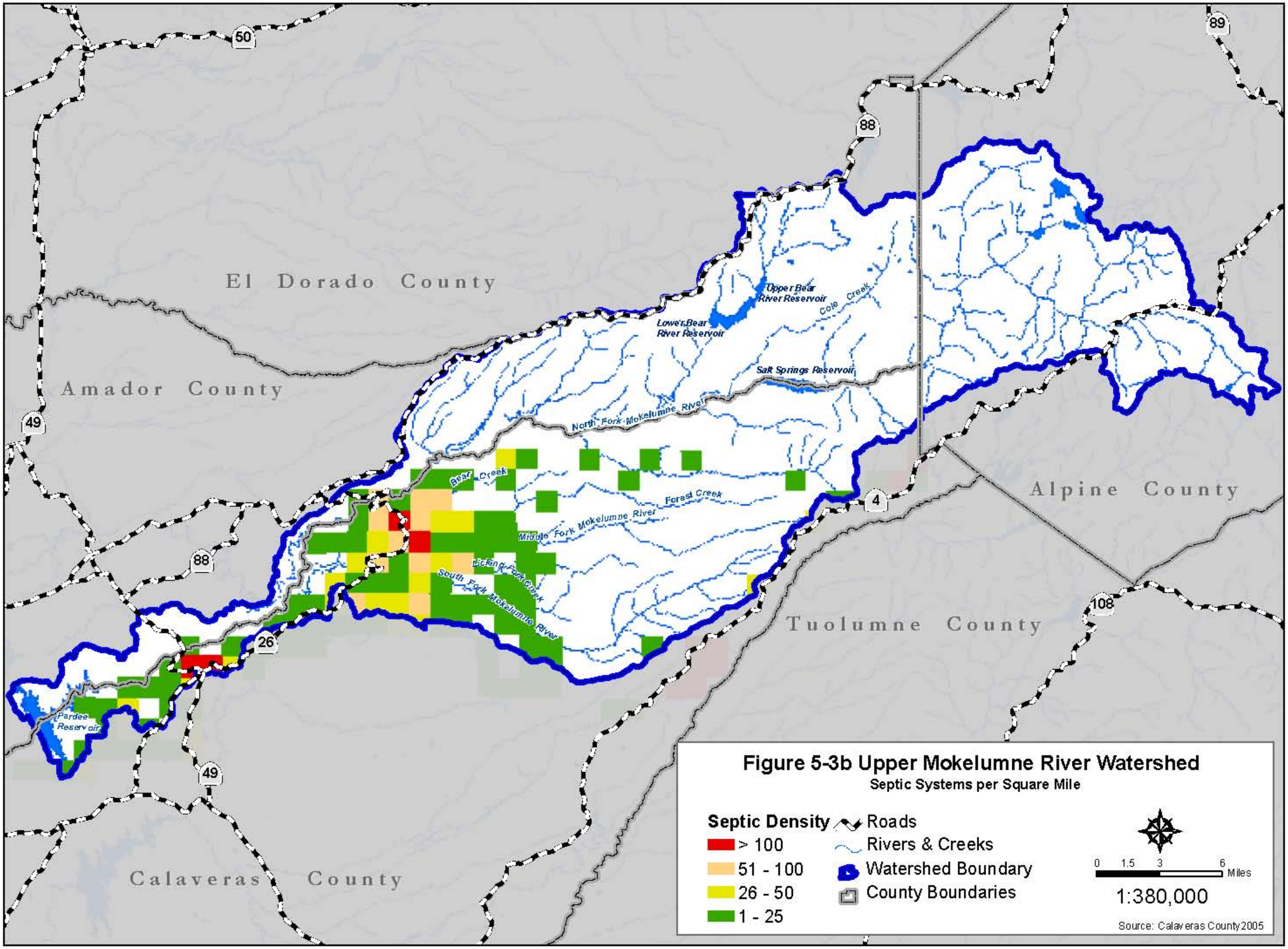


FIGURE 5-2 - Pardee Center





50
89
88
49
4
108
88
26
49
West Point Plant
Wilseyville Plant
Mokelumne Hill Plant
Pardee Recreation Area Plant
Pardee Center Plant
Figure 5-3a Upper Mokelumne River Watershed
Point Source Pollutants
Wastewater Treatment Plants
Failed Septic
Hazardous Material Generators
Hazardous Waste Sites
Roads
Rivers & Creeks
Watershed Boundary
County Boundaries
0 1.5 3 6 Miles
1:380,000
Source: Calaveras County



El Dorado County
Amador County
Alpine County
Tuolumne County
Calaveras County
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89
88
49
4
108
26
Upper Bear River Reservoir
Lower Bear River Reservoir
Cole Creek
Salt Springs Reservoir
North Fork Mokelumne River
Bear Creek
Forest Creek
Middle Fork Mokelumne River
Licking Fork Creek
South Fork Mokelumne River
Pardee Reservoir
Figure 5-3b Upper Mokelumne River Watershed
Septic Systems per Square Mile
Septic Density
> 100
51 - 100
26 - 50
1 - 25
Roads
Rivers & Creeks
Watershed Boundary
County Boundaries
0 1.5 3 6 Miles
1:380,000
Source: Calaveras County 2005

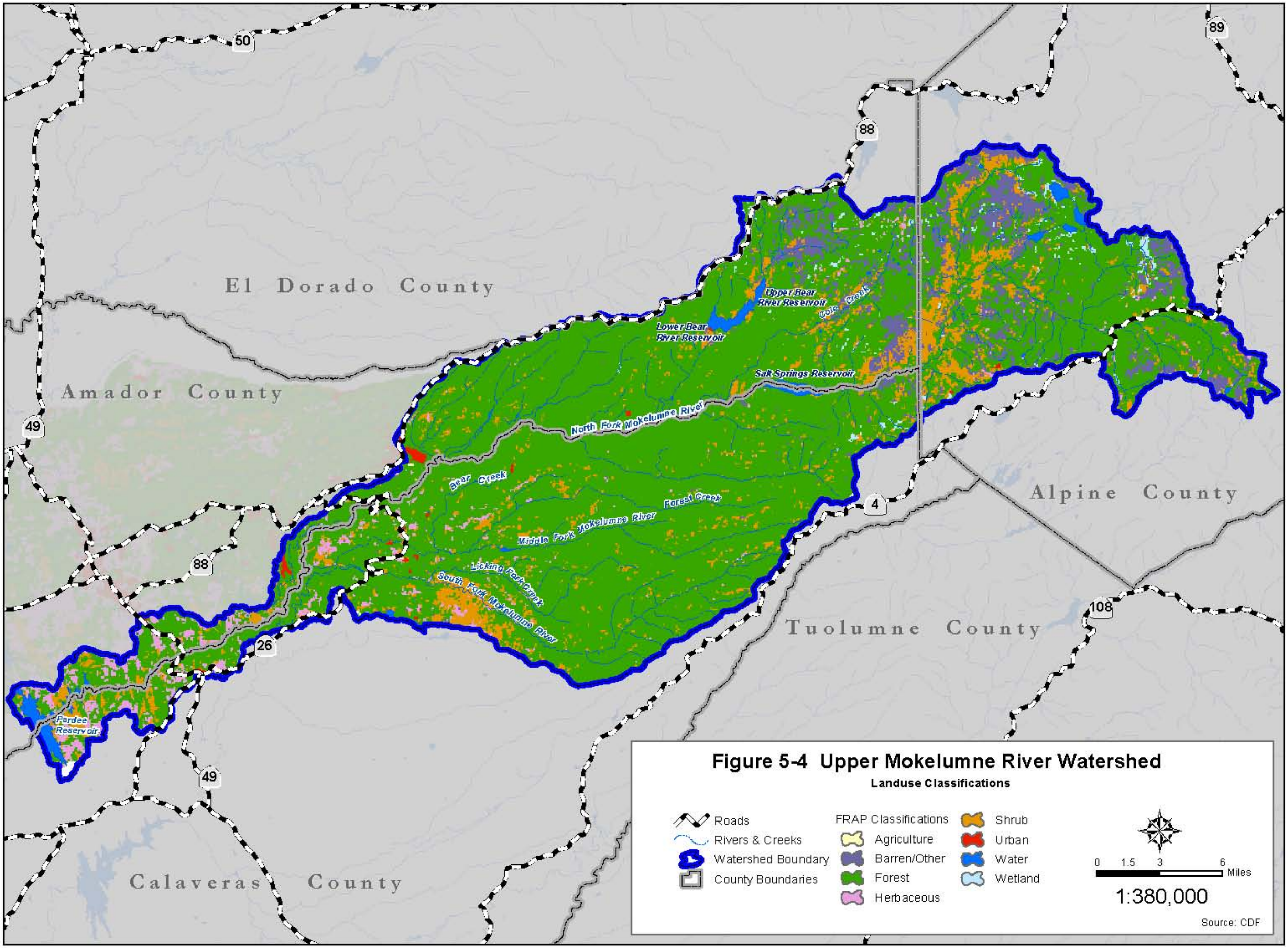

Figure 5-4 Upper Mokelumne River Watershed

Landuse Classifications

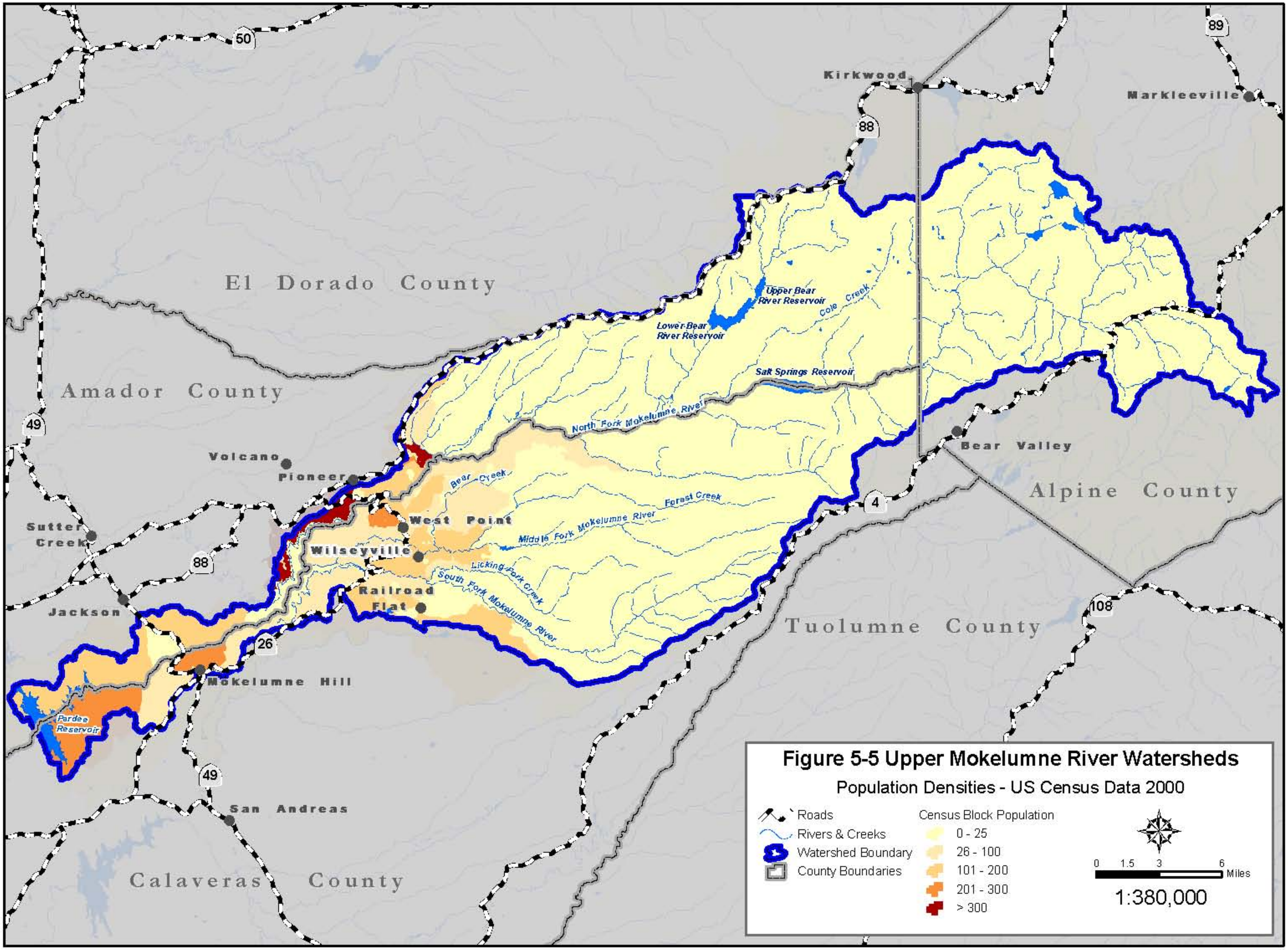

Figure 5-5 Upper Mokelumne River Watersheds
Population Densities - US Census Data 2000
Roads
Rivers & Creeks
Watershed Boundary
County Boundaries
Census Block Population
0 - 25
26 - 100
101 - 200
201 - 300
> 300
0 1.5 3 6 Miles
1:380,000
El Dorado County
Amador County
Alpine County
Tuolumne County
Calaveras County
Kirkwood
Markleeville
Volcano
Pioneer
Sutter Creek
Jackson
West Point
Wilseyville
Railroad Flat
Mokelumne Hill
San Andreas
Bear Valley
Upper Bear River Reservoir
Lower Bear River Reservoir
Cole Creek
Salt Springs Reservoir
North Fork Mokelumne River
Bear Creek
Forest Creek
Middle Fork Mokelumne River
Licking Fork Creek
South Fork Mokelumne River
Pardee Reservoir
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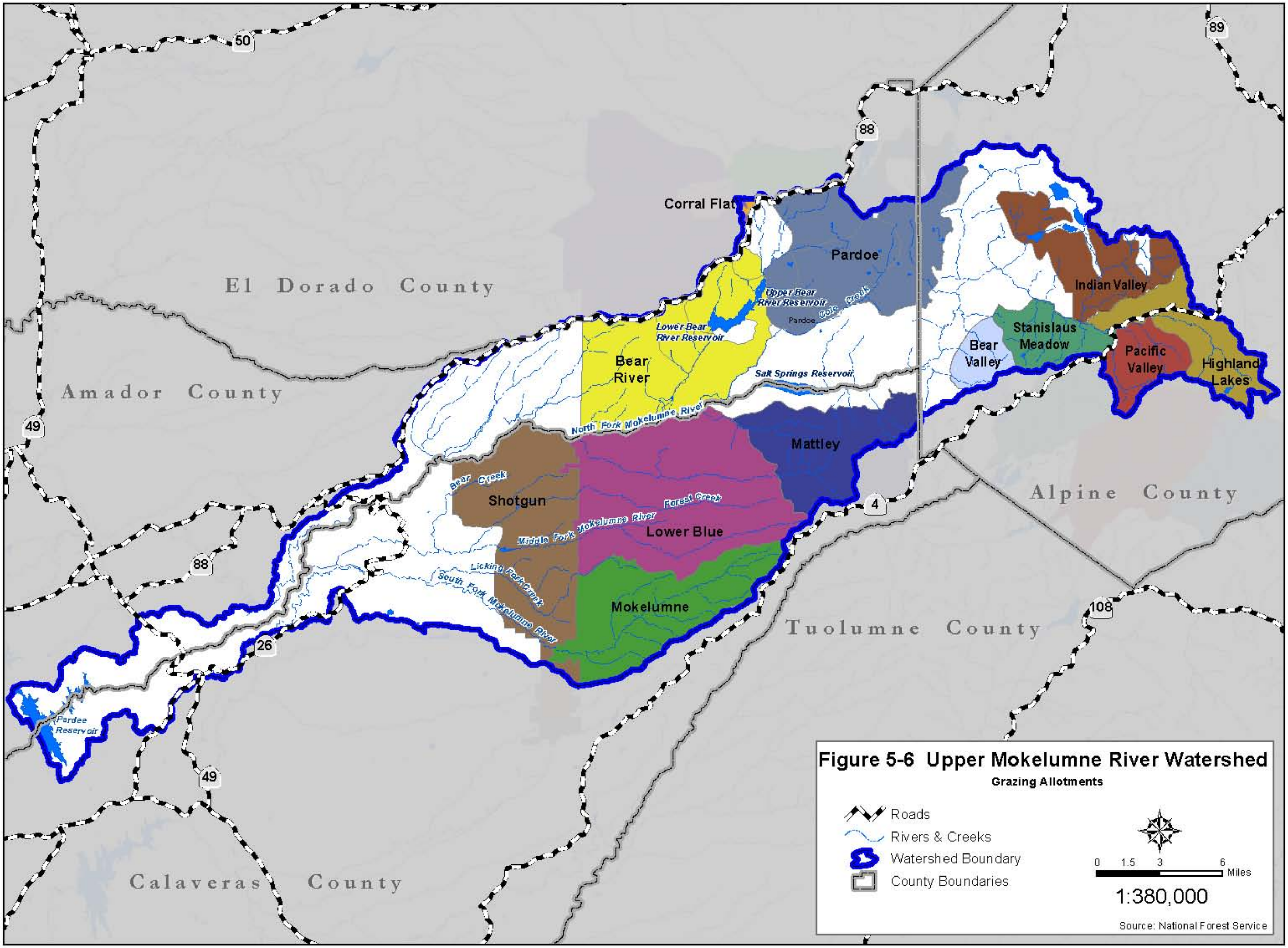


El Dorado County
Amador County
Alpine County
Tuolumne County
Calaveras County
Corral Flat
Pardoe
Upper Bear River Reservoir
Cole Creek
Lower Bear River Reservoir
Bear River
Salt Springs Reservoir
North Fork Mokelumne River
Indian Valley
Stanislaus Meadow
Bear Valley
Pacific Valley
Highland Lakes
Mattley
Shotgun
Bear Creek
Forest Creek
Middle Fork Mokelumne River
Lower Blue
Licking Fork Creek
South Fork Mokelumne River
Mokelumne
Pardee Reservoir
50
88
89
49
4
26
108
Figure 5-6 Upper Mokelumne River Watershed
Grazing Allotments
Roads
Rivers & Creeks
Watershed Boundary
County Boundaries
0 1.5 3 6 Miles
1:380,000
Source: National Forest Service

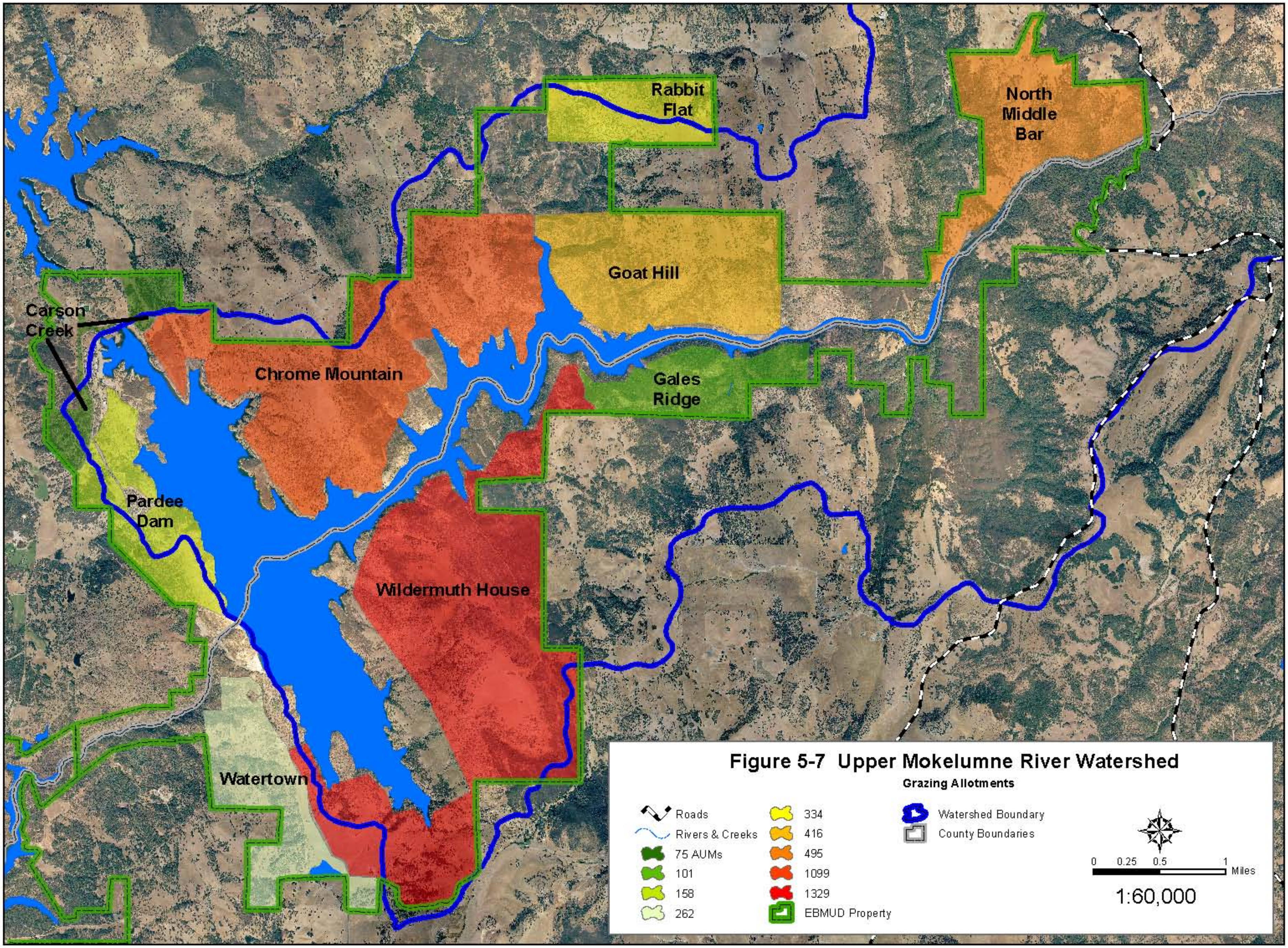
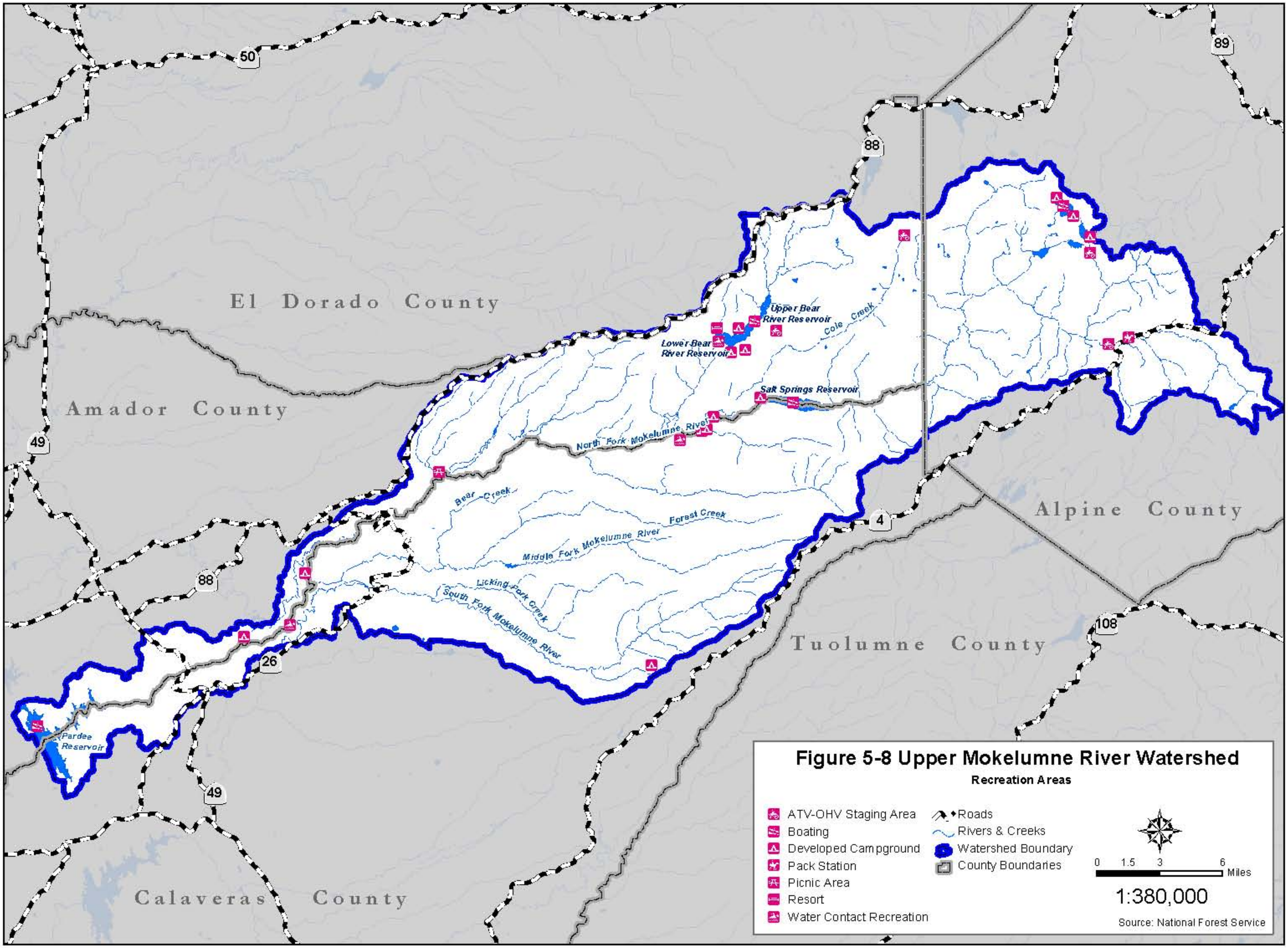


Figure 5-7 Upper Mokelumne River Watershed



El Dorado County
Amador County
Alpine County
Tuolumne County
Calaveras County
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Upper Bear River Reservoir
Lower Bear River Reservoir
Cole Creek
Salt Springs Reservoir
North Fork Mokelumne River
Bear Creek
Forest Creek
Middle Fork Mokelumne River
Licking Fork Creek
South Fork Mokelumne River
Pardee Reservoir
Figure 5-8 Upper Mokelumne River Watershed
Recreation Areas
ATV-OHV Staging Area
Boating
Developed Campground
Pack Station
Picnic Area
Resort
Water Contact Recreation
Roads
Rivers & Creeks
Watershed Boundary
County Boundaries
0 1.5 3 6 Miles
1:380,000
Source: National Forest Service

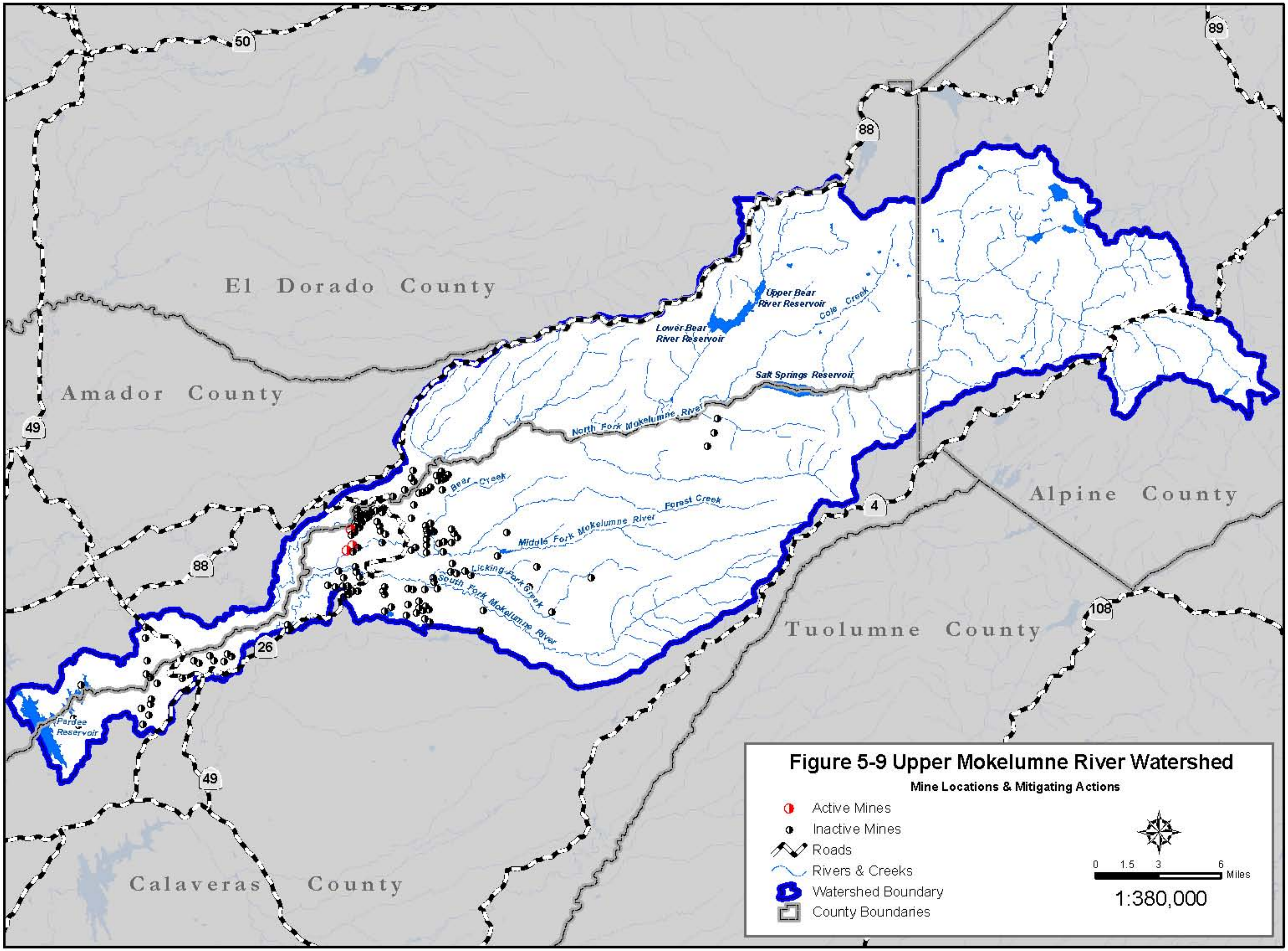


Figure 5-9 Upper Mokelumne River Watershed
Mine Locations & Mitigating Actions
Active Mines
Inactive Mines
Roads
Rivers & Creeks
Watershed Boundary
County Boundaries
0 1.5 3 6 Miles
1:380,000
El Dorado County
Amador County
Alpine County
Tuolumne County
Calaveras County
Upper Bear River Reservoir
Lower Bear River Reservoir
Cole Creek
Salt Springs Reservoir
North Fork Mokelumne River
Bear Creek
Forest Creek
Middle Fork Mokelumne River
Licking Fork Creek
South Fork Mokelumne River
Pardee Reservoir
50
89
88
49
4
108
26

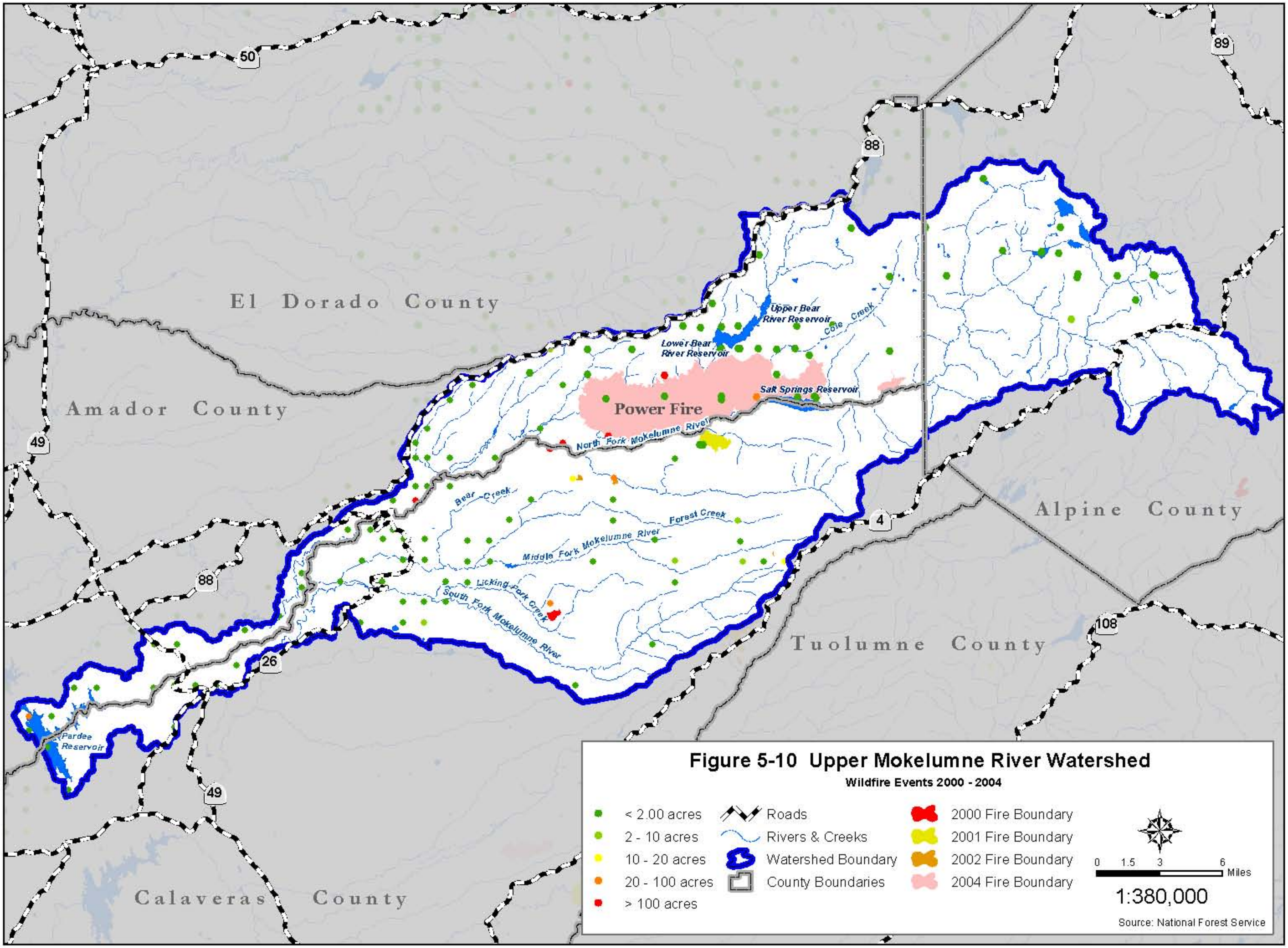
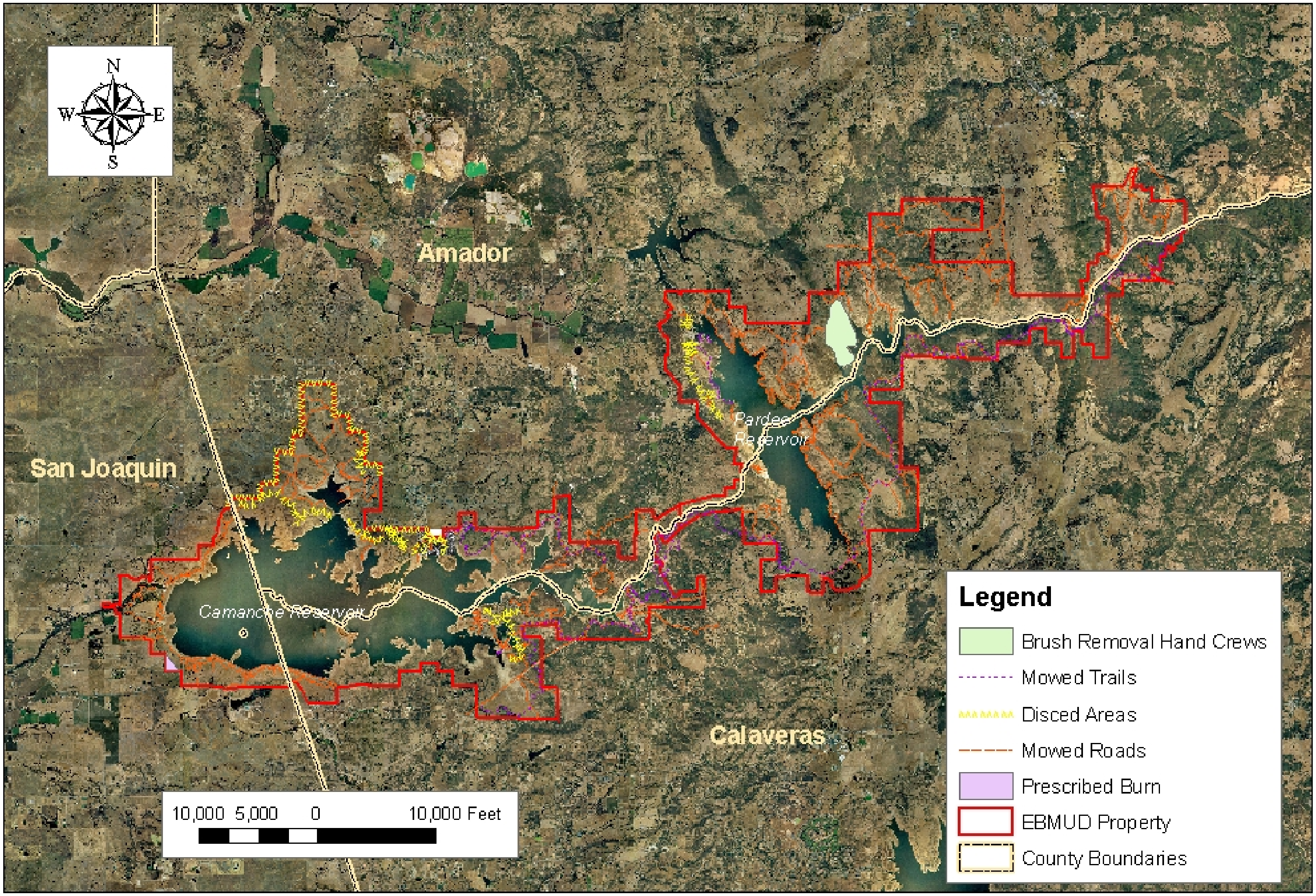


Figure 5-10 Upper Mokelumne River Watershed
Wildfire Events 2000 - 2004

FIGURE 5-11: EBMUD Fuels Management Activities (2004)



Kent Lambert, Manager
Mokelumne Watershed & Recreation Division
5883 E. Camanche Parkway
Campo Seco, CA 95685
March 2005

ANNUAL FIRE FUEL MITIGATION

EAST BAY MUNICIPAL UTILITY DISTRICT

Coordinate System:
NAD 1983 State Plane
California FIPS 0403 (feet)

FIGURE 5-12: Camanche South Shore Recreation Area

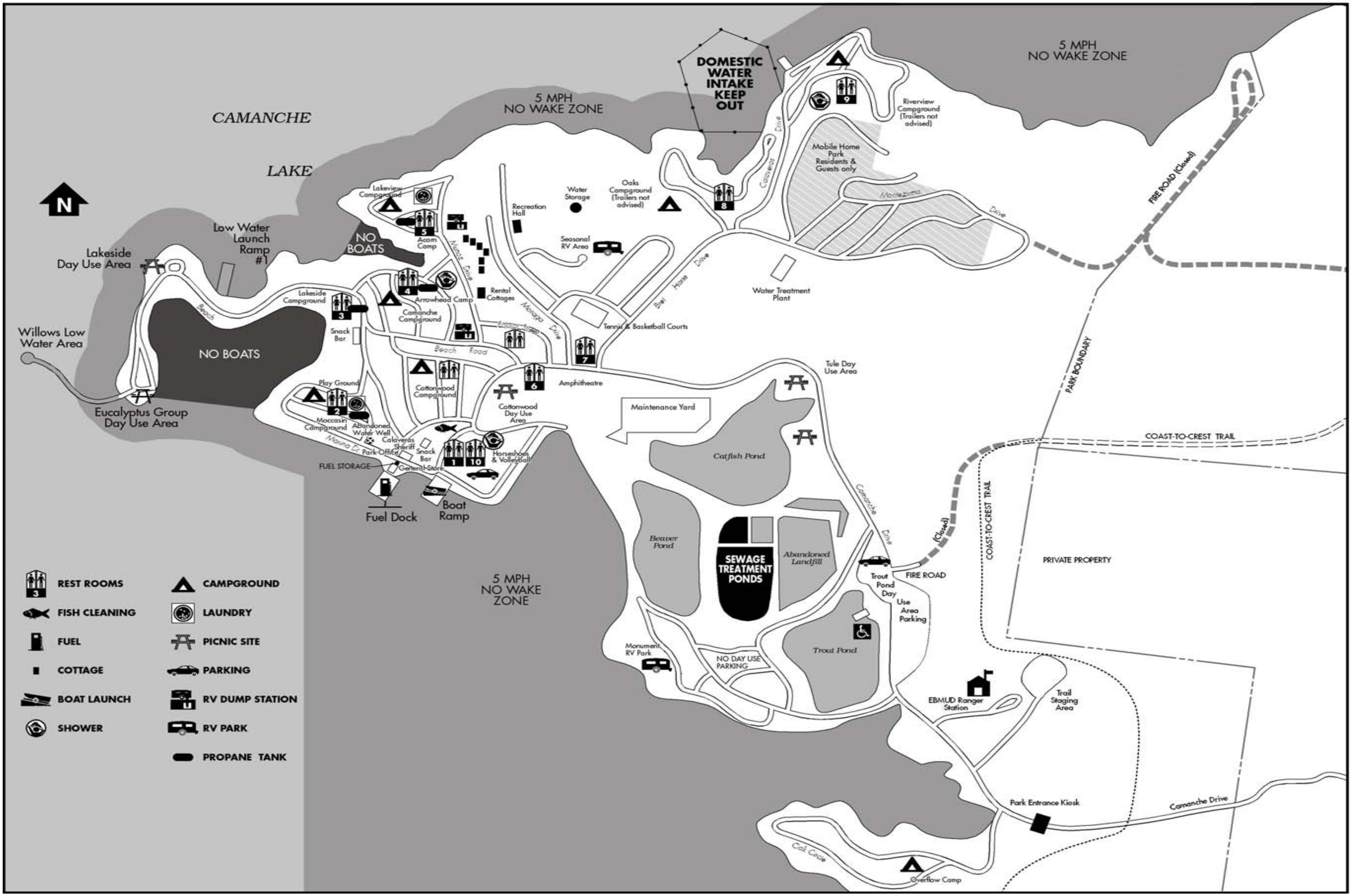
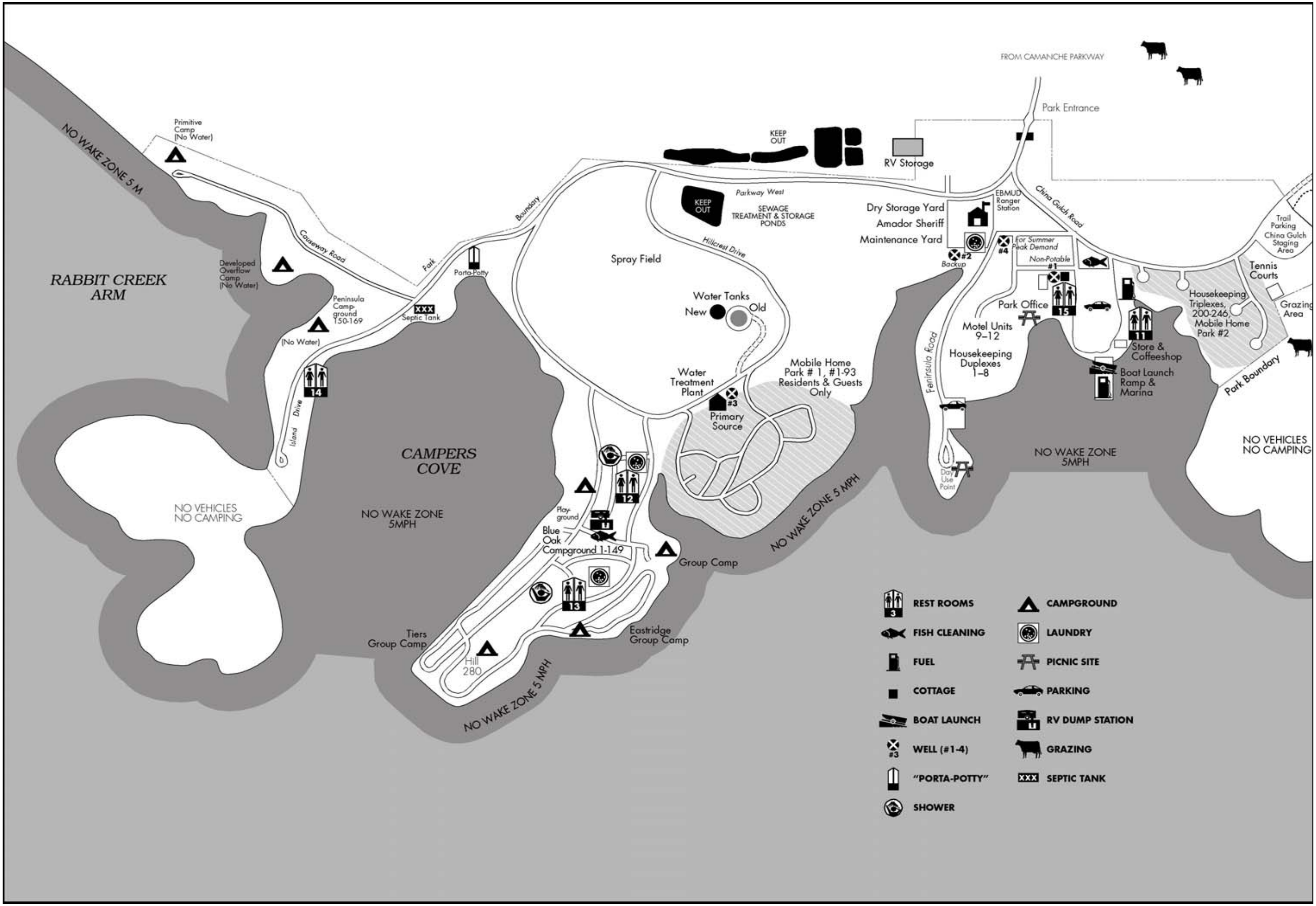
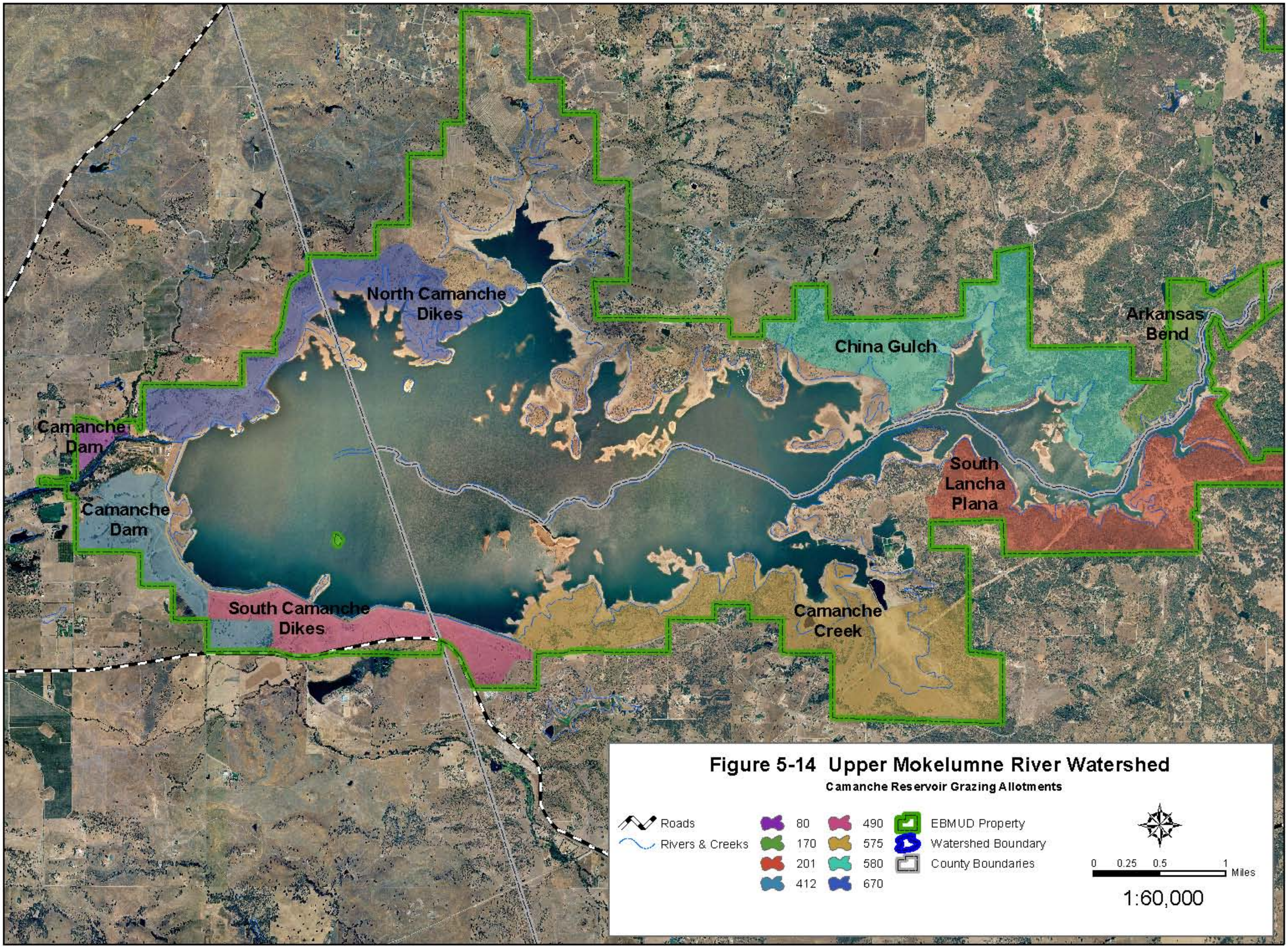


FIGURE 5-13: Camanche North Shore Recreation Area




North Camanche Dikes
China Gulch
Arkansas Bend
Camanche Dam
Camanche Dam
South Lancha Plana
South Camanche Dikes
Camanche Creek
Figure 5-14 Upper Mokelumne River Watershed
Camanche Reservoir Grazing Allotments
Roads
Rivers & Creeks
80
170
201
412
490
575
580
670
EBMUD Property
Watershed Boundary
County Boundaries
0 0.25 0.5 1 Miles
1:60,000

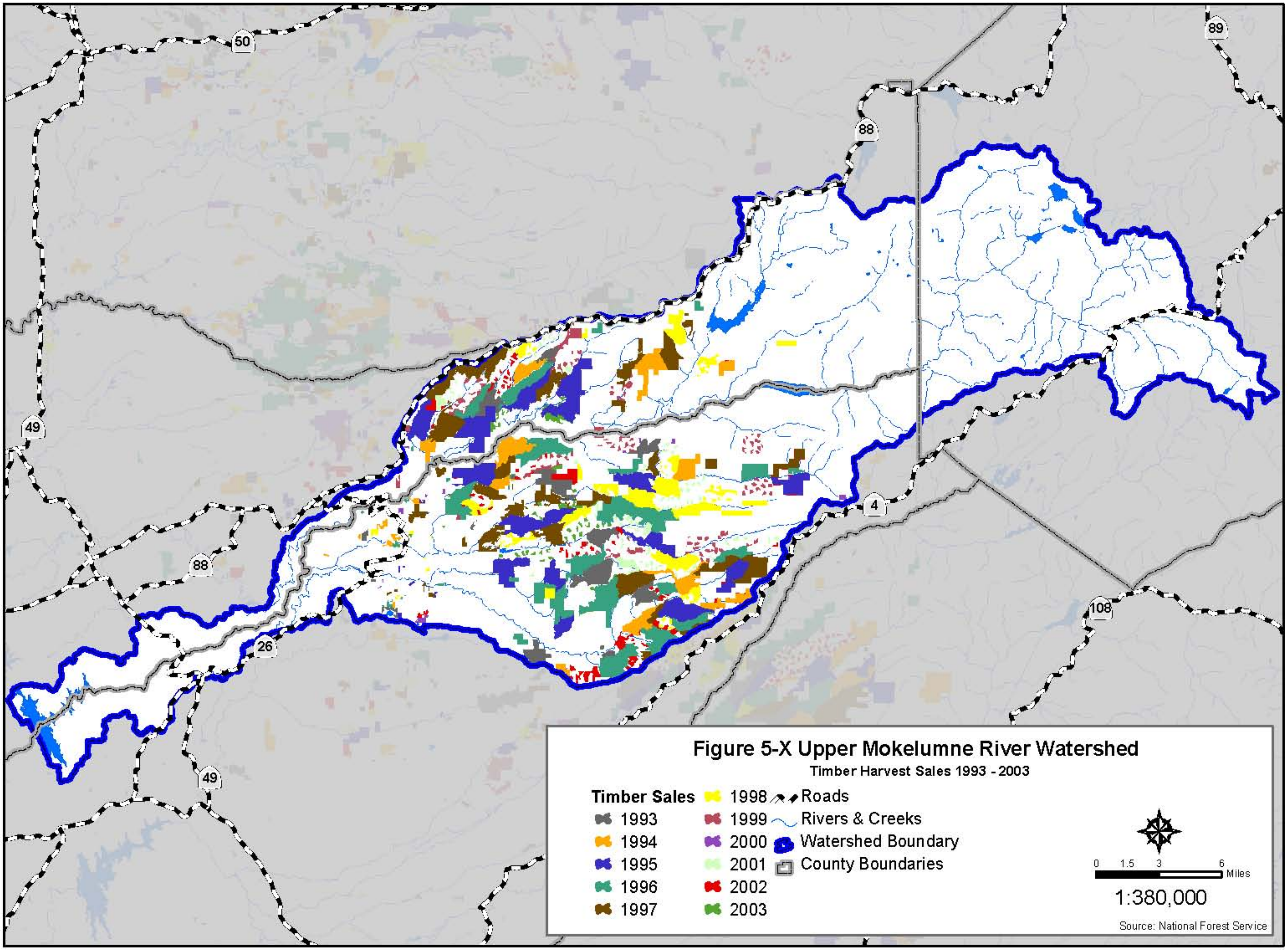

50
89
88
49
88
4
26
108
49
Figure 5-X Upper Mokelumne River Watershed
Timber Harvest Sales 1993 - 2003
Timber Sales
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Roads
Rivers & Creeks
Watershed Boundary
County Boundaries
0 1.5 3 6 Miles
1:380,000
Source: National Forest Service

Table 5-1: Pardee Reservoir Recreation Facilities

FACILITY	PARDEE RECREATION AREA Existing Size/Quantity
Tent Campsites	94
RV Campsites (short term)	12
RV Campsites (seasonal)	87
Picnic Tables	118
Roads (paved)	3 mi
Roads (unpaved)	1.5 mi
Hiking Trails	1.75 mi
Total Day Use Parking Spaces	314
Vehicle w/ Boat/Trailer or RV Parking Stalls	137
Drinking Fountains	37
Hydrants	18
Swimming Pools	2
Fish Cleaning Facilities	1
Above Ground Fuel Tanks	3
RV Dump Stations	2
Restrooms (portable)	45
TOTAL BUILDINGS	12
Restroom/Shower Buildings	4
Toilets	11
Urinals	4
Sinks	14
Heads	10
Laundry (Locations)	1
Dryers	2
Washers	2
Marina	1
Slips	70
Park Headquarters	1
Entrance Kiosk	1
Pool Building	1
Coffee Shop	1
Pump House	1
Sanitary Can Cleaning Station	1
Maintenance Shop	1
EBMUD Boat House	1
RV/Boat Storage Area	101 spaces
Boat Launch Ramps	2 Locations
Main - Elevation (540-572)	10 lanes
Low Water - Elevation (495-535)	2 lanes
Public Telephones	3

Table 5-2: Visitor Use of Pardee Recreation Area (2000-2004)

	2000	2001	2002	2003	2004
Jan	closed	closed	closed	closed	closed
Feb	7,468	7,245	9,964	9,883	8,182
Mar	8,980	10,253	9,590	9,388	4,432
Apr	9,865	10,082	10,969	9,955	11,380
May	9,859	10,832	13,214	6,128	10,594
Jun	9,108	9,552	11,357	6,789	9,629
Jul	9,534	10,923	10,947	6,552	5,086
Aug	6,693	11,806	9,793	5,198	5,086
Sep	5,742	7,132	5,596	4,872	3,799
Oct	3,750	4,098	5,628	2,309	no data
Nov	no data	no data	no data	no data	no data
Dec	closed	closed	closed	closed	closed
Total	**70,999**	**81,923**	**87,057**	**61,074**	**58,188**

Source: Ellen Schlenker, Pardee Section.

Table 5-3. Upper Mokelumne River Watershed Non-Discharging Small Community Wastewater Systems

Sub-Watershed	Facility Name	Operating Agency	Treatment Type	Type of Development	Effluent Disposal	Design Capacity (gpd)	Avg. Flow (gpd)
Middle Fork	West Point WWTP	Calaveras County Water District	Aerobic and anaerobic digestion and UV disinfection	120-acre community (about 160 connections)1	Sand filters, UV disinfection, 2 lined storage ponds and a sprayfield.	58,000	25,000
EFFLUENT RESTRICTIONS: Monthly Mean - 40 mg/L BOD5, 0.2 mL/L/hr settleable solids, 23 MPN/100 ml total coliform. Daily Max: 80 mg/L BOD5, 0.5 mL/L/hr settleable solids, 230 MPN/100 ml total coliform							
South Fork	Wilseyville Camp Sewer Treatment Plant	Calaveras County Water District	Aerated Lagoon	27 homes and a general store	Storage pond, with10-acre spray field used occasionally	9,000	6,000
	Mokelumne Hill WWTP	Mokelumne Hill Sanitary District	Two aerated lagoons, chlorination tank	Community of Mokelumne Hill (about 300 connections)1	Storage pond, and spray disposal field	150,000	60,000
EFFLUENT RESTRICTIONS: Monthly Mean - 40 mg/L BOD5, 0.5 mL/L/hr settleable solids. Daily Max: 80 mg/L BOD5, 1.0 mL/L/hr settleable solids							
Mainstem	Pardee Center WWTP	EBMUD	Extended aeration package plant	Residential, office, shop and recreational facilities for EBMUD employees	Percolation pond on Camanche Watershed	3,000	3,000
EFFLUENT RESTRICTIONS: Monthly Mean - 40 mg/L BOD5, 40 mg/L suspended solids, 0.5 mL/L/hr settleable solids. Daily Max: 80 mg/L suspended solids, 80 mg/L BOD5, 1.0 mL/L/hr settleable solids							
	Pardee Recreation Area WWTP	EBMUD	Multiple-stage oxidation/evaporation ponds	80 recreational vehicle units and a recreational center including restaurant	Evaporation spray irrigation fields outside watershed[2]	38,100	15,000
1 The populations served can be estimated by assuming approximately 2.5 persons per connection. 2 Surface water at treatment site drains to the Lake Amador watershed via Carson Creek.							

Sources: Central Valley Regional Water Quality Control Board

Table 5-4: Upper Mokelumne River Watershed – Leaking Underground Storage Tanks

Sub-Watershed	Site	Street #	Street Name	City	Substance	Case Types	Status
North Fork	BEAR VALLEY - MAINTENANCE FAC.		MT REBA RD	BEAR VALLEY	DIESEL	S	9
	BEAR VALLEY CROSS COUNTRY	1	BEAR VALLEY RD	BEAR VALLEY	GASOLINE	A	8
	BEAR VALLEY - KODIAK #8		MT REBA RD	BEAR VALLEY	GASOLINE	S	9
	BEAR VALLEY - SUPERCUB #9		MT REBA RD	BEAR VALLEY	GASOLINE	S	9
	BEAR VALLEY - OFFICE AREA #6		MT REBA RD	BEAR VALLEY	GASOLINE	A	9
	BEAR VALLEY - GRIZZLY BOWL #7		MT REBA RD	BEAR VALLEY	DIESEL	S	9
	HAM'S STATION	34950	HWY 88	PIONEER	GASOLINE	A	**8**
	BOB'S CHEVRON	24444	HWY 88	PIONEER	GASOLINE	S	9
	COOK'S STATION	31950	HWY 88	PIONEER	GASOLINE	S	9
	P & M CEDAR	25270	HWY 88	PIONEER	GASOLINE	O	9
	PIONEER ELEMENTARY SCHOOL	24625	HWY 88	PIONEER	DIESEL	S	9
	PEDDLER HILL MAINTENANCE STN	41951	HWY 88	PIONEER	WASTE OIL	A	**8**
	BEAR RIVER LAKE RESORT	40800	HWY 88	PIONEER	DIESEL	O	3B
	KAY'S SILVER LAKE RESORT	48400	KAY'S RD	PIONEER	GASOLINE	A	**9**
	PIONEER STAGE STOP	24140	HWY 88	PIONEER	GASOLINE	A	9
	SILVER LAKE FAMILY CAMP		PLASSE RD	silver lake	DIESEL	S	3A
	SALT SPRINGS RESERVOIR - PG&E		**DEAD MAN FLAT RD**	**SALT SPRINGS**	**GASOLINE**	**S**	**9**
Middle Fork	STAR GAS	22645	HWY 26	WEST POINT	GASOLINE	S	1
	MARTIN FISHER LOGGING	1165	SKULL FLAT RD	WEST POINT	GASOLINE	S	**9**
	WEST POINT EXXON	347	MAIN ST	WEST POINT	GASOLINE	A	**3A**
	WEST POINT FOREST FIRE STATION	22670	HWY 26	WEST POINT	GASOLINE	S	**9**
	SHARP'S GAS & GROCERY	22623	WEST POINT--PIONEER RD	WEST POINT	GASOLINE	S	**9**
	WESTPOINT MAINTENANCE STATION	22412	HWY 26	WEST POINT	GASOLINE	S	**9**
	WILSEYVILLE FOOD & GAS	3961	BLIZZARD MINE RD (AKA: D	WILSEYVILLE	GASOLINE	A	**7**
Main Stem	HELEN & DON MESSICK	8345	MAIN ST	MOKELUMNE HILL	GASOLINE	S	9
	SIERRA TRADING POST #8	**8026**	**HWY 49**	**Mokelumne Hill**		**U**	**3B**

Status

0 - No action taken - site status unclear
1 - Leak being confirmed/LEAK report submitted
3A - Preliminary investigation report (PIER) submitted
3B - Site assessment underway

3B - Site assessment underway
5C - Problem assessment report (PAR) completed
5R - Final remediation plan (FRP) approved

6 - Suspension of work (SOW) letter from Clean Up Fund
7 - Remediation underway
8 - Post remediation monitoring
9 - Case Closed

File: Copy of LUST.xls

Table 5-5 Caltrans Traffic Counts

Route	Location	AADT 1995	2005
26	MOKELUMNE HILL, JCT. RTE. 49	2,200	2,100
26	WINTON ROAD, WEST POINT	2,450	2,400
49	CALAVERAS COUNTY-AMADOR COUNTY	5,100	6,900
49	JACKSON, SOUTH JCT. RTE. 88	18,700	19,200
88	PINE GROVE, RIDGE ROAD	13,600	22,000
88	JCT. RTE. 26	7700	10800
	5-6% trucks		

Source: Caltrans District 10 Annual Traffic Volumes

.

File: MKWSS Highway Counts.xls

Table 5-6: Injury Collisions in Upper Mokelumne River Watershed Counties

California Highway Patrol Injury Collisions by County 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Alpine	31	56	32	51	38	34	40	35	37	42
Amador	208	275	229	248	236	264	216	236	265	262
Calaveras	258	243	279	272	261	307	256	249	303	332

File: InjuryCollisions1993to2002.xls

Table 5-7: Upper Mokelumne River Watershed - Livestock Grazing Allotments

Permitted Allotment Name	Acres	Permitted Number	Estimated Number of Calves/Cows	Permitted Period	Animal Unit Months of Forage(1)
Bear River	31,385	168 On(1) 42 Off	168 On 42 Off	06/15 - 09/30	588 On(3) 147 Off
Corral Flat	302	8 On 12 Off	8 On 12 Off	07/11 - 09/30	22 On 32 Off
Pardoe	37,120	224 On 44 Off	224 On 44 Off	07/16 - 10/10	634 On 125 Off
Indian Valley	14,607	185 On 85 Off	Vacant since 1992, Last grazed 1989	07/21-9/20	n/a
Shotgun		252	269		
Lower Blue		269	150		
Mattley		171	171		
Bear Valley		145	145		
Stanislaus Meadow		100	100		
Pacific Valley		215	94(4)		
Highland Lakes		160	104(4)		
Mokelumne		255	255		

(1) Annual unit months of forage = Animal units/month x number of months.
(2) "On" means on Forest Service Land, while "Off" means on private land within the allotment
(3) Active nonuse for 2005 due to Power Fire in October 2004.
(4) Average of 2001-2005

Table 5-8 EBMUD-Managed Grazing, Pardee Reservoir Lands

Name	Approximate Acreage	Estimated AUMs	Lease Expiration
Wildermuth House	2387	1329	October 2008
Pardee Dam	478	158	October 2008
Watertown	585	262	October 2008
Carson Creek	216	75	October 2008
Chrome Mountain	1789	1099	October 2008
Rabbit Flat	402	334	October 2008
Goat Hill	960	416	October 2008
Gales Ridge	396	101	October 2008
North Middle Bar	762	495	October 2008

Table 5-9 - Upper Mokelumne River Watershed - U.S. Forest Service Recreational Activities (1995 MRWSS)

Recreation Sites	Elev. (ft)	Months of Use	Family Camp Units	Group Camp Units	Picnic Units (day use only)	Store Within 5 miles	Toilets Flush/ Valve	Stream or Lake Water	Forest Servic e Camp-ground	Group Camp-ground	Picnic Areas	Picnic Area other than Forest Servic e	Hiking	Obser-vation Point	Fee	Boating	Boat Ramp	Fishing	Swim-ming	Drink-ing Water	Rec. Vehicle
El Dorado National Forest																					
Bear Creek	3,200	5/01-10/01			3	NO	V	YES			X										
Bear River Group	6,000	6/15-10/15		3		YES	V	NO		X			X		X	X	X	X	X	X	
Lumberyard	6,500	6/01-10/31	8			YES	V	NO	X											X	X
Mokelumne	3,200	5/01-11/15	8			NO	V	YES	X									X	X		
Peddler Hill	6,800	6/01-11/15				NO		NO						X							
Salt Springs	3,900	5/01-11/15			4	NO	V	NO			X					X		X			
Shot Rock	7,500	6/15-11/15			3	NO	V	NO			X			X							
South Shore	5,900	6/01-11/15	22			YES	V	NO	X				X	X	X	X	X	X	X	X	X
Tragedy Springs	7,900	6/15-10/15			3	YES	V	NO	X											X	
White Azalea	3,500	5/01-11/15	6			NO	V	YES	X									X	X		
Stanislaus National Forest																					
Bloomfield	8,000		10				V											X	X		X
Moore Creek	3,200	5/01-11/15	8			NO	V	YES	X									X	X		X
Hermit Valley	7,500		6				V											X	X		X

Table 5-10 Wildfire Statistics (2000-2004) (from GIS Data)

	Number of Fires by Size					
Year	**< 2 acres**	**2 - 10 acres**	**10 - 20 acres**	**20 - 100 acres**	**> 100 acres**	**Totals Fires**
2000	24	2	0	1	0	27
2001	40	6	0	0	1	47
2002	38	7	2	4	1	52
2003	33	3	1	0	2	39
2004	31	2	0	0	2	35
Total	166	20	3	5	6	**200**

file: FireHistory:xls

Table 5-11 Typical EBMUD Fuels Management Activities (2004)

TYPE OF TREATMENT	QUANTITY	COST ESTIMATE
Discing	18.7 Miles	$27,000
Roads/Trails Mowed	110.6 Miles	$9500
Brush Removal (Hand Crews)	15 Acres	$7200
Prescribed Burning	16 Acres	$7789
Total Cost		$51,489

Table 5-12 Power Fire Summary

Location	North Fork of the Mokelumne River, between Hwy 88 and Salt Springs Reservoir, 17 miles East of Pioneer. Center of fire is approximately 31(river) miles upstream of Pardee Reservoir.
Time Period	Originated October 6, 2004, 100% contained by October 21, 2004
Size	16,823 acres (5 percent of Upper Mokelumne Watershed area)
Land Type	13,738 acres National Forest, 3,085 private land. Mixed conifer and oak woodlands. Steep terrain ranging from 2,700 to 6,200 feet elevation.
Cause	Under investigation
Cost	$7,722,000

Table 5-13 Timber Harvests for National Forest Service

2000-2004 Timber Harvesting, Upper Mokelumne River Watershed within National Forest Lands			
National Forest	**acres**	**type**	**Sub-watershed**
Eldorado, Amador District	940	understory removal (smaller trees)	Sugar Pine/ Little Bear R, North Fork
	1,380	understory removal (smaller trees)	Cole Creek, North Fork
Stanislaus, Calaveras District	360	thinning	Bear/Blue/Forest Creek, Middle/North Fork
	1,300	thinning	Forest Creek, Middle Fork
	1,300	thinning	Moore Creek, North Fork
	605	thinning	Blue Creek, North Fork
	974	thinning	Blue/Moore Creek, North Fork
Total	6,859	acres	
	10.7	sq. miles	

Table 5-14: Timber Harvests for CDF

YEAR	TIMBER HARVEST PLANS FILED WITH CDF
	(total acres)
1993	493
1994	602
1995	1249
1996	1280
1997	1187
1998	733
1999	349
2000	69
2001	338
2002	836
2003	299

Source: CDF

Table 5-15: Pesticide Use on Mokelumne River Watershed Land Owned by Sierra Pacific Industries (1997-1999)

		Amount of Pesticide Applied (gallons, undiluted)		
Pesticide	EPA Registration	1997 (partial records)	1998	1999
Attrex 4L (Atrizine)	100-497	0	110	46
Esteron 99 C (2,4-D)	62719-9-264	119	122	66
Garlon 4 (Triclopyr)	464-1	4	0	0
Pronone 10G (Granular hexazinone)	33560-21	3000 lbs	2200 lbs	175 lbs
R-11 (Spreader, activator)	2935-50142	59	100	46
Roundup (Glyphosate)	various	108	231	135
Velpar L (Liquid hexazinone)	352-392	954	1422	1366

Source: Sierra Pacific Industries Pesticide Use Reports as filed with Amador and Calaveras County Agricultural Commissioner’s Offices, December 1999.

Table 5-16 Calaveras County Pesticide Use

	Acres Treated by Commodity						
Year	Forest/Timberland	Wine Grapes	Pistachios	Walnuts	Rangeland	Other	Total
2000	2,826	1,128	459	764	543	44	5,764
2001	3,506	893	220	392	230	96	5,337
2002	6,051	1,002	359	372	808	182	8,773
2003	6,799	1,237	237	739	1,094	579	10,684
2004	9,591	1,481	311	974	443	58	12,857

Source: Calaveras County Agricultural Commissioner Records

Table 5-17: Camanche North Shore And South Shore Recreation Area Facilities

FACILITY	SOUTH SHORE	NORTH SHORE
	Existing Size/Quantity	Existing Size/Quantity
Tent Campsites	323*	199
Group Campsites	0	4**
RV Campsites (short term)	119	0
RV Campsites (seasonal)	88	0
Picnic Sites	48	18
Roads (paved)	11 mi	9 mi
Total Day Use Parking Spaces	465	217
Paved Parking Spaces	141	167
Fishing Docks	1	0
Fishing Ponds	3	0
Amphitheater	1	0
Drinking Fountains	72	51
Trail Staging Areas	1 accessing 7.25 mi of trail	1 accessing 5.1 mi of trail
Volleyball Courts	1	0
Basketball Courts	1	1
Playgrounds	1	1
Fish Cleaning Facilities	1	1
RV Dump Stations	2	1
Restrooms (portable)	19	29
TOTAL BUILDINGS	95(70 private)	158(130 private)
Restroom Buildings	8	4
Toilets	51	28
Urinals	18	6
Sinks	56	30
Showers (Locations)	5	2
Heads	25	16
Laundry (Locations)	2	3
Dryers	4	4
Washers	4	4
Park Offices	1	1
Ranger Station	1	0
Entrance Kiosks	1	1
Restaurant/Cafe	0	1
Recreation Hall	1	0
Utility Building (former stables)	0	1
Projection Buildings	1	0
General Store	1	1
Service Stations (land)	1	1
Marina	1	1
Service Stations (on water)	1	1
Open berths	0	42
Covered berths	36	50
Rental Boats	11	17
Courtesy Docks	2	2
Boat Launch Ramps	4 Locations	2 Locations
SS Main - Lake Elevation (235-205)	8 lanes	
NS Main - Lake Elevation (235-200)		8 lanes
NS Main - Lake Elevation (200-197)		4 lanes
NS Main - Lake Elevation (197-194)		2 lanes
NS Low Water - Lake Elevation (194-175)		2 lanes
SS Low Water 1 Lake Elevation (225-185)	2 lanes	
SS Low Water 2 Lake Elevation (185 -160)	2 lanes	
SS Low Water 3 Lake Elevation (160-125)	1 lane	
Mobile Home Parks	1	3
Mobile Home Lots Total	70	144
Private Mobile Homes	70	131
Monthly Rentals (#15, 34, 230, Stables)		4
Rental Cottages Buildings	7	10
Triplexs (220, 223, 224, 225) 4 BLDG		4 BLDG
"A Unit" Motel Rooms (King Size Beds)		4
"B Unit"4 Person Housekeeping		4
C Unit" 6 Person Housekeeping		4
Cottages/13 BLDG MHP1, MHP3, CSS	7	6 BLDG
Motel Room (Twin Size Beds)/ 1 BLDG		4
4 Person Housekeeping/ 12 BLDG	7	9
TOTAL TRIPLEX AND COTTAGE UNITS	7	25
Maintenance Facilities		
Shop Buildings	1	1
Storage Buildings	1	3
Fenced Yards	2	1
Sewage Treatment Facilities		
Sewer Lift Stations	6	3
Sewer Treatment Ponds	3	6
Sewer Spray Fields	0	1
Water Treatment Facilities		
Water Tanks	1	1
Wells	1	4
Raw Water Pumping Platforms	1	0
Backwash Ponds	0	2
Telemetry Buildings	1	1
Treatment Plant Buildings	1	1
Dry Storage Yards	0	3
Spaces	10 (in maintenance yard)	180
Public Telephones	3	6

** Work is in progress to modify the campgrounds at Camanche South Shore Recreation Area. Accordingly, the number of available campgrounds is expected to change as the redevelopment is completed.*
*** Capacities of 12, 24, 72 and 72 persons per site.*

Table 5-18: Visitor Use of Camanche South Shore Recreation Area (2000-2004)

	2000	2001	2002	2003	2004
January	8,821	9,256	9,512	12,613	12,076
February	9,554	9,680	11,583	13,616	13,321
March	13,073	15,758	14,392	14,955	17,581
April	18,542	16,593	14,716	15,325	21,039
May	20,137	24,263	23,644	25,991	23,615
June	27,019	27,694	28,600	32,664	24,203
July	30,760	30,309	34,794	35,402	29,954
August	26,869	24,270	29,309	31,041	24,229
September	16,548	15,472	18,334	17,796	17,473
October	10,395	10,509	11,602	13,448	9,784
November	9,358	9,528	10,871	11,415	13,825
December	9,090	8,625	9,668	10,099	14,514
Total	200,166	201,957	217,025	234,365	221,614

Table 5-19: Sewer Overflows at Camanche Reservoir South Shore

DATE	LOCATION	TYPE OF RELEASE	METHOD OF CLEANUP
12/4/04	CASS: Section F1, Site 6	Accidental discharge from a broken connection from a trailer	Disinfectant placed over spill which was later removed
12/4/04	Camanche South Shore	100 gallon sewage spill by resident - soil only impact	Soil disinfected
9/7/04	Camanche South Shore	50 gallon sewage spill by resident - soil only impact	Soil disinfected
7/18/04	Camanche South Shore	50 gallon Sewer Spill on soil	Soil disinfected
5/23/04	Camanche South Shore	Sewer back up in bathroom produced about 5 to 10 gallons - no soil or waterway impacted.	Roto-rooter contacted to unclog drain
1/23/03	Camanche South Shore	sewage spill of 100 gallons on soil near mobile home hock up.	Soil disinfected
1/5/03	Camanche South Shore	100 gallon sewage spill by residient - soil only impact	Soil disinfected
1/4/03	CASS; f-4,5,&6	SSOs; lateral cleanouts	Blockage cleared; area cleaned and sanitized
12/24/02	Camanche South Shore	sewage spill of 100 gallons on soil	Soil disinfected
12/21/02	CASS: Lakeview, Restroom #5	Sewage overflow at cleanout between restroom and lift station #2; 10-15 gal	Removed sewage from area; cleaned and disinfected.
6/16/02	CASS: RV Dump Station #2	Sewage overflow at dump station inlet	Removed sewage overflow; sanitized area
6/12/02	CASS: RV Section F-6, Space 6	Sanitary overflow; approx. 5 gal	Removed sewage overflow; sanitized area
3/30/02	CASS: Manhold downgradient of Fish Cleaning; upgradient of lift station #1	Sanitary overflow; approx. 200 gal	Removed fish solids and liquid; sanitized area; no sewage
2/25/02	CASS: Manhole in Day Use Area	Sanitary overflow; approx. 200 gal	Isolated with caution tape and allowed to air dry; no solids were observed.
12/31/01	CASS; MH Park, Space #17	sewage - 300 gallons	Area diked; solids pumped into WWTP; sanitized w/ca hyp
12/22/01	CASS; MH Park, Space #17	sewage - 200 gallons	impacted surface area sanitized with sodium hypochlorite
11/20/01	CASS; MH Park; manhole overflowed	sewage <50 gallons	vactor; discharged into WW pond
9/17/01	CANS; MH #13 & #14	sewage 7100 gallons	vactor; discharged into WW pond
6/29/01	Camanche South Shore	Resident trailor produced sewer spill - about 900 gallons - only soil impacted	Soil disinfected
6/26/01	CASS; MH Park; Montezuma Drive	sewage 400 gallons	vactor; discharged into pond; sanitized area
5/27/01	Restroom 3, Snackbar Parking lot	sewage overflow	Flow trenched, unplugged blockage, area sanitized
1/26/01	CASS between MHP and catfish pond	sewage spill	
1/13/01	CASS, F4.5	sewage spill 3x5 area	
9/25/00	CASS, MH Park @#1	sewage	
8/26/00	CASS, Campground Restroom 2	Backup of sewer lines	blockage removed, area sanitized with hypo
8/25/00	CASS, Campground Restroom 2	Backup of sewer lines	blockage removed, area sanitized with hypo
7/23/00	CASS, Marina Parking Lot	sewage - 2 gallons	RV accidentally spill portion of raw sewage on ground

File: Sewage Spills 2000-2204.xls

Fig 5-20 Visitor Use of Camanche North Shore Recreation Area (2000-2004)

	2000	2001	2002	2003	2004
January	7,649	9,420	9,412	13,207	12,592
February	993	9,111	11,497	14,680	13,082
March	12,556	16,692	15,540	16,050	17,690
April	18,837	19,332	15,469	16,867	19,428
May	18,480	21,449	23,349	24,852	26,866
June	21,760	24,619	23,111	27,471	28,485
July	26,452	28,589	29,797	31,537	37,686
August	22,738	22,657	24,350	28,655	28,392
September	12,749	13,380	14,913	16,891	21,367
October	9,554	9,575	9,300	13,873	12,757
November	9,305	10,167	10,078	12,367	11,365
December	8,799	7,846	7,990	10,676	10,717
Total	178,372	192,837	194,806	227,126	240,427

Table 5-21 Sewer Overflows Camanche North Shore

DATE	LOCATION	TYPE OF RELEASE	METHOD OF CLEANUP
12/7/04	Camanche North Shore	100 gallon sewage spill by resident - soil only impact	Soil disinfected
7/31/04	Camanche North Shore	20 gallons sewer spill by Resident - soil only	Soil disinfected
3/15/04	CANS: btwn ponds 3 & 6	accidental discharge	Saturated soil excavated and drained into wastewater ponds; area sanitized
2/13/04	Camanche North Shore	Small sewage spill from resident - about 10 gallons with only soil impacted	Soil disinfected
1/20/04	CANS: marina store forced main	accidental discharge	Saturated soil excavated and drained into wastewater ponds
12/12/03	CANS - Mobile home Park #1, Sp.# 30	Sewer Cleanout cap leaking	Removed approx. 10 gallons of liquid and dumped into downstream manhole. Sanitized area.
11/20/01	CASS; MH Park; Space #24; Scorpion Street	sewage 50 gallons	Area diked; pumped into manhole; sanitized w/ca hypo
1/26/01	CANS - west of sewer ponds, Amador Co. Lift station	overflow from vault	pump restarted, area sanitized.
9/4/00	West of CANS gate - private property	sewer overflow - 1,500 gal	area diked and pumped out

File: Sewage Spills 2000-2004.xls

Table 5-22: Active Grazing Leases on EBMUD land around Camanche Reservoir

Name	Approximate Acreage	Estimated AUMs	Lease Expiration
West Portal	52	35	October 2008
Arkansas Bend	243	170	October 2008
China Gulch	1118	580	October 2008
Camanche Dam	438	492	October 2008
North Camanche Dikes	697	670	October 2008
South Camanche Dikes	420	490	October 2008
Camanche Creek	1243	575	October 2008
South Lancha Plana	797	201	October 2008

Table 5-23: Fires on Mokelumne Watershed

Date	County	Location	Acreage
5/26/2000	Amador	Cam North Shore Rec Area	2.0
5/28/2000	Amador	Camanche Rd. near Front Gate	2.0
6/3/2000	Calaveras	Cam S. Shore Rec Ara	0.5
7/2/2000	Amador	Cam North Shore Rec Area	0.2
7/27/2000	Calaveras	Hwy 49 at Mok. River Bridge	4.0
8/28/2000	Amador	Lakeview Dr.	5.0
11/18/2000	Amador	Above Middle Bar Bridge	3.0
		Total 2000	**16.7**
6/13/2001	Amador	Hwy 88 to Cam. Reservoir	2200.0
6/14/2001	Calaveras	Below Pardee Dam	0.5
8/4/2001	Calaveras	S. Camanche Pkwy	1.5
8/7/2001	Calaveras	Penn Mine Rd.	1.5
9/25/2001	Calaveras	Paloma Rd/Lawry Flat	2.0
10/9/2001	Amador	Cam North Shore Rec Area	1.0
		Total 2001	**2206.5**
5/11/2002	Calaveras	Arkansas Ferry Rd.	2.0
5/16/2002	Amador	Cam North Shore Rec Area	52.0
6/8/2002	Amador	N. Camanche Pkwy	75.0
7/3/2002	Amador	Pardee Recreation Area	70.0
8/15/2002	Amador	Buena Vista Rd.	20.0
8/24/2002	Calaveras	Cam S. Shore Rec Area	5.0
8/27/2002	Calaveras	Cam S. Shore Rec Area	1.0
		Total 2002	**225.0**
3/7/2003	Amador	Middle Bar	8.0
7/5/2003	Calaveras	Campo Seco Rd	3.0
7/5/2003	Calaveras	S. Camanche Pkwy	9.2
7/12/2003	Calaveras	Chili Camp Rd.	25.0
7/25/2003	Amador	EBMUD watershed property	31.0
9/2/2003	Calaveras	Sandretto Rd.	3.0
		Total 2003	**79.2**
5/12/2004	Amador	Curran and Dry Creek Rd.	15.0
5/30/2004	Amador	N. Camanche Pkwy & Coal Mine Rd	5.0
7/5/2004	Calaveras	S. Camanche Pkwy/Dike 1	3.0
8/5/2004	Amador	N. Camanche Pkwy	5.0
		Total 2004	**28.0**

Table 5-24: Summary of Contaminant Sources and Their Impact on Water Quality

Contaminant Source	Key Contaminants	Potential to Impact to Drinking Water Quality
Fires and Fuels Management	**Turbidity** Algae/Taste and Odor TOC SOCs, VOCs, pesticides, herbicides	<u>*Medium to High*</u> -Increasing fuel stock in National Forests -Fires due to lightning strikes are a significant threat. -While fires make land vulnerable to erosion, heavy rainfall is necessary to induce major erosion and impact water quality. -BMPs (goat grazing, firebreaks, etc.) are being implemented.
Geologic Hazards	**Turbidity** Radionuclides General minerals and Metals TOC	<u>*Medium to High*</u> -High erosion risk lands within watersheds and in close proximity to water bodies. -Historically landslides have occurred in close proximity to water bodies.
Wildlife and Livestock	**Turbidity** Algae/Taste and Odor **Microorganisms** General minerals and Metals TOC **Nutrients**	<u>*Medium to High*</u> -Grazing on many private lands is not regulated or tracked -Cattle grazing can be significant source of microorganisms, especially Cryptosporidium -Erosion and TOC loadings from cattle grazing -BMPs have been developed for implementation.
EBMUD Facilities (Excluding recreation)	**Microorganisms** Turbidity General minerals Metals TOC **Oil and grease, other hydrocarbons**	<u>*Medium to High*</u> -Increasing visitor use at Camanche Reservoir -Facilities including septic systems proximate to the reservoirs and tributaries. -Sewage spills have occurred at Camanche facilities -Maintenance activities can contribute contaminants.
Recreation (EBMUD)	Turbidity Algae/Taste and Odor **Microorganisms** General minerals and Metals TOC **Oil, grease, other hydrocarbons, MTBE**	<u>*Medium to High*</u> -Recreation use is increasing at Camanche Reservoir -Recreation is encouraged at both reservoirs. -Recreation is prohibited near the outlet towers. -Body contact is permitted in Camanche Reservoir. -Cross contamination from privately owned boats can be a significant issue. -Fire hazards increase with visitor use.
Recreation (Sierra Pacific, Eldorado & Stanislaus National Forests, Bureau of Land Management, PG&E)	**Turbidity** Algae/Taste and Odor Microorganisms General minerals, Metals TOC Oil and grease, other hydrocarbons, MTBE	<u>*Medium to High*</u> -Recreational activities occur at reservoir and river locations throughout the watershed basin -Increased access and recreation sites along Mokelumne River -Erosion due to OHV use becoming more prominent in watershed

Table 5-24: Summary of Contaminant Sources and Their Impact on Water Quality (continued)

Contaminant Source	Key Contaminants	Potential to Impact to Drinking Water Quality
Mines	Turbidity Radionuclides **General minerals and Metals** Oil and grease, other hydrocarbons	*Medium to High* -Active and inactive mines exist throughout watersheds. -Water quality degradation due to mine discharges has been significant. -Mines are proximate to reservoirs and main tributaries.
Logging	**Turbidity** **Nutrients** **Algae/Taste and Odor** **General minerals** and Metals Microorganisms TOC SOCs, VOCs, pesticides, herbicides oil and grease, other hydrocarbons	*Medium to High* -Logging is still extensive in Upper Mokelumne watershed, though , decreasing in some areas. -Increasing criteria assessed in harvest plans on public and private lands -Logging roads cut areas provide access for OHVs -Logging roads traverse watersheds and cross tributaries. -Pesticides used for vegetation management. -Housing, maintenance, and administrative facilities are located within watershed
Utilities - Hydroelectric Power Generation	**Turbidity** **Algae**/Taste and Odor **Temperature** General minerals and Metals TOC SOCs, VOCs, pesticides, herbicides Oil and grease, other hydrocarbons	*Low to High* -Operations of facilities can dramatically affect water temperatures. -Extensive hydroelectric facilities occur throughout Pardee and Camanche watersheds -Hydroelectric facilities are integrated into the complex system of reservoirs, canals, and tunnels
Rural Area Runoff - Residential	Turbidity Algae/Taste and Odor **Microorganisms** General minerals and Metals TOC SOCs, VOCs, pesticides, herbicides Oil and grease, other hydrocarbons	*Low to High* -Rural areas are sparsely populated, but there are less control measures for erosion and sanitation facilities -Rural development is increasing
Sanitation Facilities	Algae, Taste and Odor **Microorganisms** TOC	*Low to High* -Impacts from leaks and spills are dependent on location of incident, amount and type of material, and response time -Failed septic systems have been documented -Aging septic systems more prone to fail

Table 5-24: Summary of Contaminant Sources and Their Impact on Water Quality (continued)

Contaminant Source	Key Contaminants	Potential to Impact to Drinking Water Quality
Transportation Corridors	**Turbidity** General minerals and Metals TOC SOCs, VOCs, pesticides, herbicides **Oil and grease, other hydrocarbons**	*Low to Medium* -Increasing development increases road utilization -Main thorough-fares proximate to reservoirs. -Storm water drains feed directly into the reservoirs. -Accidents occur along main thoroughfares. -Maintenance activities can contribute contaminants. -Logging activities create roads throughout watershed -Trends toward integrated pest management for road maintenance
Unauthorized Activities (Illegal Dumping)	Turbidity Algae Microorganisms General minerals and Metals TOC SOCs, VOCs, pesticides, herbicides Oil and grease, other hydrocarbons	*Low to Medium* Access roads to the reservoirs increase risks of impacting water quality. Illegal dumping increasing with additional populations and increasing dump fees.
Agriculture	Turbidity Algae/Taste and Odor General minerals TOC SOCs, VOCs, pesticides, herbicides	*Insignificant* Agricultural properties are few and small. Some agricultural activities have eliminated the use of pesticides and herbicides.

Notes: Bold indicates contaminants of greatest concern.
Ranking of land uses and activities is based on contaminants of concern, proximity to water bodies, magnitude of sources, watershed characteristics, and any mitigating factors. Contaminants are prioritized as follows:

1. Microbiological contaminants with the potential for acute illness.
2. Algae and inorganic compounds which contribute to taste and odor problems.
3. Turbidity which also transports adsorbed contaminants.
4. Total organic carbon which when disinfected can form DBPs.
5. Other organic and inorganic compounds which are at or below detection limits in raw waters.

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Introduction

Section 6 documents watershed management practices of the District and other public and private entities that may have a significant impact on water quality within the Upper Mokelumne River and Camanche Watersheds. For the 2005 update, management practices that were documented in the previous Mokelumne River Watershed Sanitary Surveys were reviewed and supplemented with information from the District and outside agencies. The District's organizational structure and the tables describing jurisdictional authority were also reviewed and remain for the most part unchanged from the 2000 MRWSS. Documenting the practices that are implemented within the watersheds and the division of authority among public agencies provides a basis for understanding where and how future modifications can be made.

Organizational Structure

One component of a watershed sanitary survey is to define the "lines of communication" between responsible agencies as well as within the District. A summary of the agencies that have jurisdictional authority within the Upper Mokelumne River and Camanche Watersheds is presented to provide an overview of the agencies involved and a basis of understanding their responsibilities with regard to water quality.

This section also provides an overview of the specific divisions within the District that are responsible for managing the land uses and activities within the watersheds, operating the reservoirs, monitoring water quality, and providing water treatment and distribution. Several divisions within the District are responsible for water quality - from source water through treatment and distribution - identification of these divisions, their responsibilities, and areas of overlap is important to define for the overall management of source water quality.

Jurisdictional Authority in the Watershed

Table 6-1 summarizes the local/regional, state, and federal agencies and utilities, and their concerns or jurisdictional authority that is relevant to the Camanche and Upper Mokelumne River Watershed lands. Identification of the agencies that have jurisdictional authority within the watersheds as well as their corresponding issues of concern can assist the District in the event that Best Management Practices need to be modified and/or created, and to develop open lines of communication between interested agencies. Each of these agencies has a role in achieving adequate source water protection and their active participation is essential for successful protection.

EBMUD Organizational Structure

From a water quality and watershed management perspective, the two most critical departments within the District are the Operations and Maintenance (O&M) Department and the Natural Resources Department. These departments have as part of their primary responsibilities the management of the District-owned lands and facilities surrounding Pardee and Camanche Reservoirs. Figure 6-1 gives an overview of the organizational structures of both of these departments.

The mission of the O&M Department is to operate and maintain, manage, and improve the District's water system infrastructure, processes, and assets; provide safe, reliable, and high quality drinking water; engage and educate the District's stakeholders; and reflect sound environmental and financial stewardship.

The Water System Department within the O&M Department includes groups whose activities impact and/or pertain to the water quality and watershed management of the East Bay water supply facilities. For the Camanche and Pardee water supply facilities, the Water Supply Division, is responsible for the daily operations and maintenance functions for the Camanche and Pardee Reservoir water supply, wastewater collection and treatment, and water treatment and distribution facilities. These facilities include Pardee and Camanche dams and power plants, reservoir operations, water supply system outlet towers, treatment plants, distributions systems, wastewater collection, treatment and disposal facilities, and the facilities that monitor water quality and quantity data to support operations.

The Natural Resources Department organization is divided into three divisions -- East Bay Watershed and Recreation Division, the Fisheries and Wildlife Services Division, and the Mokelumne Watershed and Recreation Division.

Watershed Management Practices

This section provides an overview of the practices and policies that have potentially significant impacts on source water quality in the Camanche and Upper Mokelumne River Watersheds. Management practices of the District and of public entities are reviewed. The 2000 MRWSS summarized the District's Land Use Master plan and the policies of the U.S. Forest Service, Soil Conservation Service (now the Natural Resources Conservation Service), and the California Department of Fish and Game (CDFG). For the 2005 update, management practices of the District's Natural Resources Department were outlined and documents from public agencies pertaining to watershed water quality were reviewed. These documents are listed in Table 6-2 and they are discussed in context of the following watershed management categories:

- Land Use Planning
- Access control
- Erosion Control
- Pest Management
- Logging Practices
- Grazing and Livestock Management
- Mineral Exploration and Mining
- Stormwater Management
- Waste Management
- Structures, Dredging, and Fill Management
- Inspection, Surveillance, and Enforcement Procedures
- Emergency Response
- Public Education
- Fire and Fuels Management

The MRWSS Update 2000 category of "Vegetation Management" has been rewritten into the "Logging Practices" and the "Fire and Fuels Management" sections.

Table 6-2: Documents Reviewed for MRWSS Update 2005

ID	Agency	Title	Date	Affected Management Practice
1	Amador County	Grading Ordinance	2003	Erosion Control
2	Amador County	Pesticide Use BMPs (by SPI)	2003	Pest Management
3	Amador County	General Plan, Housing Element Update	2005	Land Use
4	Amador Firesafe Council	Amador County Fire Hazard Reduction Plan	2004	Fire & fuel management
5	Calaveras County	General Plan, Housing Element Update	2005	Land Use
6	Calaveras County	Local Agency Ground Water Protection Program	2004	Waste Management
7	Caltrans	Stormwater Program Annual Report	2005	Stormwater Management
8	City of Jackson	Land Use Element	2004	Land Use
9	EBMUD	Various watershed management practices and BMPs	2005	Access Control, Pest Management, Recreation, Public Education, Erosion Control, Inspection, Surveillance, & Emergency Response, Grazing, Fire and Fuels Management
10	USDA Forest Service	Record of Decision (ROD) for Sierra Nevada Forest Plan Amendment	2004	Grazing, Fire and Fuels Management, Pest Management
11	USDA Forest Service	Water Quality Management For Forest System Lands in California Best Management Practices	2000	Logging, Grazing
12	Eldorado NFS	Final Environmental Impact Statement - Power Fire Restoration	2005	Fire & fuel management
13	PG&E	Ecological Committee Reports, Land Stewardship agreement	2005	Land Use
14	PG&E	Mokelumne River Project, FERC Project No. 137 Relicensing Agreement	2004	Land Use
15	Stanislaus NFS	Stanislaus Fire Plan	2004	Fire & fuel management
16	Stanislaus NFS	Forest Road Analysis	2001	Erosion Control
17	Stanislaus NFS	Forest Plan Direction: Motor Vehicle Travel Management	2004	Erosion Control, Access Control

For acronyms, see Appendix G.

U.S. Forest Service Watershed Management

The U.S. Forest Service (USFS), a division of the U.S. Department of Agriculture, directs the management of the Eldorado and Stanislaus National Forests which together encompass all national forest lands within the watershed. Both entities have approved land and resources management plans for their respective areas of jurisdiction. The plans contain standards and guidelines, as well as specific plans and management area prescriptions. Some management goals, activities and guidelines contained in those plans that could improve or affect water quality aspects of public health concerns are described in the 2000 MRWSS.

A new Sierra Nevada Forest Plan Amendment (SNFPA) was promulgated in January 2004. The amendment established management direction, land allocations, desired future conditions, standards and guidelines for management actions, and a strategy for supporting adaptive management of forest lands. The plan refined management direction for (1) old forest ecosystems, (2) aquatic, riparian, and meadow ecosystems, and (3) fire, fuels, and forest health. The 2004 SNFPA superseded a 2001 Amendment that had many visionary objectives but was difficult to implement in practice. Components of the 2004 SNFPA are discussed further in this Section 6.

The document “USDA Water Quality Management for Forest Lands in California: Best Management Practice” establishes uniform Best Management Practices (BMPs) for protection of National Forest Service (NFS) lands in California from nonpoint source contaminants. As part of the water quality management program, the following actions will be carried out:

- Existing and potential nonpoint pollution sources will be identified and evaluated for the necessity and schedule of improvement or treatment projects. Watershed improvement funds will be used if no other funds are available for these projects.

- BMPs will be perpetually implemented through training of employees about BMPs, keeping BMPs current, and BMP monitoring and evaluation

- BMPs will be improved or developed as a result of management practice monitoring and evaluations.

- BMPs for the resource activities that may affect water quality are provided in this document. Each BMP provides a description of the activity, the potential effects on water quality, method for implementation of actions to mitigate or eliminate the effects of the activity. BMPs were identified for the following resources and activities:
  - Timber Management
  - Road and Building Site Construction
  - Mining
  - Recreation
  - Vegetation Manipulation
  - Fire Suppression
  - Watershed Management
  - Range Management

Watershed management most directly affects water quality. It provides procedures to repair watershed conditions and improve water quality and soil stability. For example, studies will be undertaken to activities that adversely affect water quality, such as occupancy and modification to the floodplains and wetlands. Activities in wetlands will also be restricted where practical alternatives are available. If necessary, Forest Service will exclude activities that impair quality as a last resort.

Furthermore, multiple management activities which individually will not create unacceptable effects, but collectively degrade water quality, will be identify for their cumulative off-site watershed effects. Water quality monitoring programs will collect and evaluate data to establish baseline conditions for comparison with established water quality standards. These programs are usually part of an environmental document, management plan, special use permit, or as a response to other needs
.

EBMUD Watershed Management

The 1970 EBMUD Land Use Master Plan describes the policies for District-owned watershed lands surrounding Pardee and Camanche Reservoirs and the river reaches immediately upstream from each. A summary of key elements of the Land Use Master Plan that directly or indirectly relate to water quality include: ownership for most control of watershed land, cooperating with sanitary districts and septic tank-leach field inspection officials to minimize contamination, minimizing erosion, minimizing fire damage, restricting unauthorized access, allowing multiple uses of District land for open space preservation (including grazing, fishing and/or boating), planning for comprehensive land uses to optimize public benefits which comply with the District Master Plan and public education programs on the importance of watershed lands. The Mokelumne Watershed Master Plan is planned for development in 2006 to replace the 1970 plan, and a draft is scheduled in 2007. For the 2005 update, the District's management practices were documented for access control, fire & fuels management, erosion control, pest management, grazing, inspection, surveillance, control, and emergency response.

EBMUD: Access Control

In the period since 1995 the District added two new parcels to properties around Pardee Reservoir: the 540 acre Anderson Ranch property in Grapevine Gulch and the 160 acre Goose Hill parcel adjacent to the Pardee Recreation Area. In addition, the District acquired two conservation easements on the Pardee Reservoir Watershed: the 329 acre Garamendi Conservation Easement in Poorman Gulch and the 9 acre Pitto Conservation Easement in Rich Gulch.

All Camanche and Upper Mokelumne River watershed lands owned by the District are fenced and posted, with human access strictly controlled. The shorelines of Pardee Reservoir and the Mokelumne River where it passes through District land are also fenced to exclude cattle. Cattle are not excluded from the riparian areas of some subordinate tributaries, but the District has plans to do so in the future. All roadways within EBMUD watershed lands are either gated or fenced along the entire passage through District lands.

In 2003, the District officially sanctioned the use of a portion of the property in the Middle Bar Bridge area for the use of river rafters and kayakers to exit the river. As noted in Section 5, the Middle Bar Take-Out Facility includes a 20-space paved parking area (including two handicapped spots), a two station handicapped accessible toilet and a short surfaced trail to the rivers edge. No permits, fees or access passes are required for the general public use of these facilities.

District Capital Security Improvements. The District is engaged in the first of several phases of Capital Security Improvement Projects (CSIP) as a result of the Vulnerability Assessment (VA) that was conducted by the District in 2003. The projects involve improving fencing, lightings, gate access controls, building access controls, CCTV recording, alarm systems, etc. across District facilities. While the exact nature of these improvements are not described for obvious security reasons, improvements will be significant, at an overall cost, spread over the next 5 years, of over $21M. These improvements will protect the District's critical infrastructure.

EBMUD: Fire and Fuels Management

The Mokelumne Watershed & Recreation Division provides fire suppression resources and response procedures in order to safely facilitate the Division's timely and effective response to fires in its area of concern. Response, training guidelines, and other essential elements of this program are documented and updated annually in the Mokelumne Watershed & Recreation Division Fire Plan.

The California Department of Forestry (CDF) has the primary wildland fire suppression responsibility for all District lands within the Mokelumne Area. Local Fire Districts and Volunteer Fire Departments (Local Agencies) have the primary structure fire suppression responsibility for all District properties within the Mokelumne Area. Mokelumne Watershed and Recreation Division firefighters are responsible for assisting with the suppression of wildland fires within the Mokelumne Area, on District property. In addition, District firefighters cooperate in the suppression of wildland fires on adjacent property and support the efforts of CDF and Local Agencies in structure protection, vehicle/vessel fires and dumpster fires on District property to the extent reasonable and appropriate.

Currently, all District firefighters must complete a minimum of 50 hours of initial training and a minimum of 16 hours of annual wildland firefighting training. There are 8 vehicles equipped with fire suppression equipment and necessary radios to conduct effective communication with all responding agencies. Since 2000, Mokelumne Watershed and Recreation Division Firefighters have responded to 100 fires.

Red Flag Protocol is outlined in the Mokelumne Watershed & Recreation Division Fire Plan. This procedure outlines the notifications and operational steps that will take place in the event a Fire Weather Watch or Red Flag Warning is issued for District property in the Mokelumne Area. The purpose of this procedure is to ensure that the District takes all prudent measures necessary to reduce fire hazards on District property and to maintain firefighting capability, equipment and patrols. All Mokelumne area employees, concessionaire employees, and recreational visitors are notified when a Red Flag Warning is issued. Operational changes include extra patrols by rangers, increased water storage at recreation areas, and the prohibiting of activities that create sparks such as outdoor cutting, welding or mowing.

The **Woody Fuels Management Program** was reinstituted in late 1995 as a means of removing down and dead wood from areas where it could constitute a fire hazard. The program is open to all members of the public and EBMUD employees. There is a 2 cord limit per person and cost $10.00 per permit. The exception to this fee is driftwood whereas permits are issued at no cost and there is no limit on the amount of driftwood that may be taken. Since 1995, a total of 503 permits have been issued and 508 cords of wood removed from District property. Of this amount, 146 cords have been driftwood.

The Mokelumne Watershed and Recreation Division has an active program of fire hazard mitigation that involves disking, mowing, brush removal, prescribed burning, livestock grazing and other measures. These mitigation measures are described briefly below.

Disking. Disking is accomplished on an annual basis in the late spring in order to provide fuel breaks on portions of the property boundary that are bordered by residential developments and other urban interfaces. Recreation Area road edges most susceptible to fire starts are also disked. During the 2005 MRWSS Update period, the trend has been to replace disking with mowing in order to minimize erosion where slopes are steep or the fire threat is low.

Mowing. Interior fire access roads and public hiking/equestrian trails are mowed annually in order to reduce the threat of accidental fire starts while minimizing impacts from erosion that would be facilitated by grading the soil to bare ground.

Brush Removal. The District works effectively with the California Department of Forestry (CDF) and the California Youth Authority (CYA) and the California Department of Corrections (CDC) to remove or reduce heavy stands of brush near adjacent residential properties and at locations strategic to the spread of catastrophic wildfires. This is accomplished by manual removal using hand tools wielded by state wards from the local conservation camps at Pine Grove and Vallecito under the direct supervision of the CDF. Brush removal is conducted using techniques established to minimize soil erosion and is directed by District staff. Figure 6-2 shows an area of brush removal on Rocky Ridge near Pardee Reservoir.

Prescribed Burning. Mokelumne Watershed and Recreation Division Rangers conduct vegetation management burns for multiple purposes on the watershed on an annual basis. These purposes include integrated pest management for noxious weed control, fire suppression training and vegetation conversion from brush to grasses and other herbaceous plants.

In addition to fuel reduction and control of noxious weeds, the benefits of these burns include improved range conditions, improved wildlife habitat, increased water production, and conditions favoring biodiversity. The amount of annual acreage burned is variable from year to year.

Other Measures. Concessionaires for the District operating within about 2,500 acres of developed Recreation Areas also have an active program of mowing and line trimming estimated to cost them about $85,000 per year.

EBMUD: Grazing

Livestock grazing on 12,900 acres of District owned watershed is utilized for fuels management and accounts for the removal of an estimated 26,000 to 50,000 tons of grasses and other one hour fuels in the grazing leases. The amount varies depending on the annual rainfall and corresponding forage production. The lease agreements stipulate that residual dry matter (RDM) is to be left on the ground in order to minimize erosion and enhance both the quality and quantity of forage produced. The RDM requirement varies by slope according to the Table 6-3.

EBMUD: Erosion Control

Best Management Practices (BMPs) for erosion control are being developed/adopted for use on the District owned watershed. Current BMPs on the watershed include but are not limited to the use of the following measures to protect construction sites and areas of disturbed soil from erosion during the wet weather season.

- placement of silt fences and erosion control coils on project perimeters
- tarping of spoils piles

- use of silt dams for work in the riparian/aquatic environment
- use of erosion control tarps and blankets, jute netting, straw, seeding and hydromulching on disturbed soil
- placement of straw bales, check dams and sediment traps in runoff channels
- monitoring of construction sites and streams during storms for evidence of erosion
- strategic placement of stockpiles of erosion control materials for emergency use

EBMUD: Pest Management

As discussed in Section 5, the Mokelumne Watershed and Recreation Division has an Integrated Pest Management program to address pest issues in its area of responsibility. The Mokelumne Division has implemented a Best Management Practice with regard to herbicide application and use. Two points from this document are listed below:

- Herbicides shall not be used within 1,000 feet of reservoirs or tributary creeks, except for spot treatment of pest plant species only. Application within this 1,000-foot zone must be approved prior by the IPM Committee.
- When herbicide application has been approved by IPM Committee within the 1,000 foot zone, the following restrictions apply:
    - There shall be a minimum 3 foot wide zone maintained from flowing watercourses, standing water, or aquatic habitat where spot spray application shall be prohibited. Direct target plant contact application may occur in accordance with herbicide label.
    - Outside the 3 foot zone, spot spray application is allowed provided drift does not occur. Wind speeds shall essentially be near zero.

The District has also partnered with the Amador Weed Advisory Group (AWAG). AWAG is a collection of agencies, organizations, companies, and private citizens committed to collaborate in activities to prevent and control noxious weeds in Amador County. Noxious weeds pose a threat to Amador County crops, rangelands, irrigation systems, roadsides, wild lands, recreation areas and private residences. AWAG's activities focus on exclusion, detection, suppression, and eradication of species listed as noxious weeds by the California Department of Food and Agriculture. Public outreach and education is a major emphasis. EBMUD is a principal participating agency of AWAG, and has been since it's formation in 2000.

EBMUD, through a Memorandum of Understanding, has agreed to:

1. Promote the control and treatment of noxious weeds on District lands using approved Integrated Pest Management techniques.
2. Identify and map all noxious weed occurrences on District lands.
3. Support AWAG's efforts to control and prevent noxious weeds in Amador County.

EBMUD: Inspection, Surveillance, and Enforcement

The Mokelumne Watershed and Recreation Division has Resource Patrol Units (RPU) whose primary responsibility is to protect the public and District property in the Mokelumne area. This is achieved through patrolling all areas in the watershed. Patrol methods used to make public contacts include vehicle, boat, ATV, bicycle and foot. Examples of the public contacts made include checking entry permits, giving directions or information to recreation facilities, and enforcement and education of park rules. The patrol truck is the primary means of patrol for the RPU. On average, the RPU logs 48,505 total vehicle miles per year. Four permanent rangers are tasked to maintain coverage 7 days a week, 365 days per year. Additionally, two more rangers are reassigned on a temporary basis during the peak visitor and fire season (May through September). Assisting rangers in patrol functions are local sheriffs brought in under contract. Two full-time deputies from both Amador and Calaveras counties are assigned year-round to District lands.

EBMUD: Emergency Response

The RPU also takes the lead for the District response to wildland fires on or near our property. Along with our fire response, the RPU responds to variety of emergencies within our recreation and watershed property. These emergencies include hazmat spills, vehicle accidents, boating accidents, physical altercations, and medical emergencies. Because of proximity of District offices to the recreation areas, the RPU is often first on scene of a variety of medical emergencies. This quick response by District staff has justified the acquisition of Automatic External Defibrillators now carried on RPU patrol vehicles. Drownings, physical assaults, bee stings, boating and vehicle accidents are just some of the medical emergencies attended by RPU staff.

Security Shift Supervisors.. Security Shift Supervisors are trained first responders for any security or emergency response incident and have access to the full range of resources available to the District. If there is a report or threat of a terrorist or other security concern or any natural or man-caused emergency, while Mokelumne staff coordinates these matters with the local Sheriffs offices, fire departments and other resources, the District Security and Emergency Preparedness Office requests that the Security Operations Control Center (SOCC) also be called, at 510-287-0999. The SOCC will notify the on duty Shift Supervisor and the Manager of Security and Emergency Preparedness, who will coordinate with the involved superintendents and managers in the Mokelumne area, and scale the appropriate response and Emergency Operations Center support in keeping with the Standardized Emergency Operations System (SEMS), National Incident Management System (NIMS) and the National Response Plan (NRP).

EBMUD: Public Education

Rangers from the Mokelumne Division participate in several annual events. Rangers attend a career days at local elementary schools and talk about their career field and their own career at EBMUD. Rangers attend Fire Prevention week and describe to the public our role in fire prevention efforts from our own offices to methods incorporated in the campgrounds and watershed lands. We also host an annual River Clean-up day in which members of the public meet and spend a day collecting refuse from the Mokelumne River. The Mokelumne Trailbusters, a dedicated group of volunteers managed by East Bay Municipal Utility District, is involved with three (3) diverse land stewardship projects in Amador and Calaveras Counties. These projects are: construction of a thirty (30) mile segment of the Mokelumne Coast to Crest Trail; planting native vegetation, erosion control and riparian restoration at Pardee and Camanche Reservoir Recreation and Watershed Areas and participating in the Mokelumne River clean-up in the Pardee/Camanche area. The Trailbuster Work Schedule (every other Saturday through out the year) includes outings such as Bald Eagle tours; Wildflower hikes; Native American Cave Paintings tours; Gold Rush History tours; the annual California & National Trail Days hike/work project. Participation varies from 3 to 65 individuals.

Land Use Planning

Effective land use planning is critical to the overall protection of source water quality. Depending upon the specific land use, any number of water quality parameters can be effected including turbidity, microbes, organics, and inorganics. Section 5 which addresses potential contaminant sources as they relate to land uses and activities provides specific details regarding the water quality concerns corresponding to the land uses identified. Below is a brief summary of some of the land use planning programs in both Calaveras and Amador counties.

County governments have the authority to restrict activities on lands within the counties that are subject to their jurisdiction. This is done primarily through the establishment and enforcement of land zoning ordinances. Uses of a parcel of land must be consistent with the zoning for that parcel. How a parcel is zoned is determined in part by the General Plan for the county. A General Plan is a long-range policy guide designed to be used by public officials and citizens in the development of land. These General Plans designate specific land uses for each parcel within the counties. For example, the Calaveras General Plan has two general land uses: community development lands and natural resource lands. The community development lands consist of community centers, residential centers, and future single family residential. The natural resource lands include wildlife habitats, botanical areas, timberlands, mineral resource areas, dam inundation areas, and agriculture preserves. Zoning must be consistent with the land uses designated by the County Plan. Zones fall into four general categories: interim zones, resource production zones, residential zones, and commercial/economic zones.

The General Plan and zoning in Amador County is very similar to the General Plan and zoning for Calaveras County. Zones may be consistent with a variety of land uses. For example, in Calaveras County, the timber production zone (a subset of resources production zones) is consistent with all land uses as defined in the County Plan. Most of the land owned by the largest private landowner in the Mokelumne River Watershed, Sierra Pacific Corporation, is zoned for timber production with some parcels zoned unclassified (Calaveras County) or R1A (Amador County).

NPDES C.3 development-related stormwater impact requirements started taking effect in 2004, with planning implications for each new development or significant redevelopment. The timing of feedback from review for each permit is crucial since conditions of approval can only be changed in the planning phase, with the California Environmental Quality Act (CEQA) documentation, if required. Only during the planning department or planning commission approval stage can the project have attached Conditions of Approval with BMPs effectively implemented. After that initial approval phase, more Conditions of Approval are not possible.

Amador County General Plan - Housing Element Update (2005)

The Amador County General Plan Housing Element identifies and analyzes current and future housing demands in the county. Of the 35,000 residents, the majority (57%) inhabit the unincorporated portions of the county. The projected overall annual population growth in the county is expected to be around 2.9%, with the unincorporated population growing at a lower rate of 2% annually.

The Amador Water Agency (AWA) provides the majority of water to Amador County. AWA has three water treatment plants at Buckhorn, Tanner, and Ione. The primary source of water is the Mokelumne River. AWA has an allocation of 15,000 acre-ft of water from Lake Tabeaud. However, only 7000 acre-ft actually reaches customers due to evaporation and seepage from open miner’s ditches constructed in the 1850’s. As a result, the water is at or near-capacity.

To meet increasing demand for water, the Amador Transmission Project will replace 23.5 miles of deteriorating transmission system with 30” pipeline. Construction will begin in summer of 2005 and increasing available water will commence in early 2007. Furthermore, expansions in the three treatment plants will increase available capacity.

AWA wastewater effluent discharges are disposed via subsurface leach fields and spray disposal fields. A review to expand or share of facilities with EBMUD near Camanche Reservoir is on-going. Also, a county-wide regional wastewater management is under development with the cities.

Calaveras County General Plan – Housing Element Update (2005)

One of the primary limits to housing development in Calaveras is the available water and sewer infrastructure. Nine agencies provide water and/or sewage to the communities in Calaveras County. Also, the Angels Camp, the only incorporated town in Calaveras County, provides its own public water and sewage system. Most of the population inhabits the unincorporated area (92.6%). About 75 percent of residents are served by on-site septic systems.

In general, the counties sewer facilities are at or near capacity, while few water systems are at or near capacity. Availability of wastewater connections potentially constrains development of the San Andreas, Forest Meadows, Valley Springs and Murphys communities. The community of Sheep Ranch is constrained by the lack of available water capacity.

To provide for future development the individual districts may raise funds to expand facilities. Also, there is consideration to allow for higher density allowance for residential areas where service connections are readily available to sustain growth.

City of Jackson Land Use Element (2004)

The 2004 Land Use Element replaces the 1981 Land Use Element and is intended to provide guidance for planning development in the next 20 years. Eleven distinct neighborhoods were identified in the element in conjunction with the Land Use Designations Map. Concerns pertaining to the watershed include the development of agricultural areas in Southwest Jackson, requiring careful handling of wetlands and vegetation and disrupting geological slopes, and encroachment of commercial and residential areas onto Jackson Creek and the floodplains.

The Land Use Element recommends the establishment of a grading ordinance, encourages the public use of the city's many creeks, discourages development, and requires new development proposal in the Creek/Floodplain overlay to obtain Planning Commission approval.

PG&E Land Conservation Commitment Stewardship Council

Under a bankruptcy settlement agreement for PG&E approved by the PUC on December 18, 2003, PG&E will protect 140,000 acres of watershed land associated with its hydroelectric system, plus its 655-acre Carrizo Plains in San Luis Obispo County. The Pacific Forest and Water shed Lands Stewardship Council will ensure the compliance of PG&E with the settlement's requirements to donate land and grant conservation easements.

The Stewardship Council will identify the public value of PG&E Watershed Lands, develop management objectives, and determine the future use of the land. It will recommend the donation or exchange of lands which best meet conservation efforts. Proposed land disposition will be presented to the PUC for public notice, hearing, and approval.

The Stewardship council is funded with $70 million through PG&E over 10 years. Of that balance, $20 million is expected to go into the planning process and with the remainder going into physical improvements, such as planting of trees to enhance fish and wildlife habitat and water quality. Presently, the amount of affected lands within the Mokelumne Watershed has not been determined. As noted in Section 2, PG&E owns over 5,000 acres (1.4%) within the Upper Mokelumne River Watershed.

Upper Mokelumne River Watershed Authority

The Upper Mokelumne River Watershed Authority (UMRWA). The UMRWA is a coalition of stakeholders (Alpine County, Alpine County Water Agency, Amador County, Amador Water Agency, Calaveras County, Calaveras County Water District, Calaveras County Public Utility District, EBMUD, Jackson Valley Irrigation District). The UMRWA is entrusted, with stakeholder and Proposition 13 and 50 grant funding, to develop the Upper Mokelumne River Watershed Assessment. The project will develop watershed assessment methodologies, compile existing data on watershed conditions, perform water quality monitoring, develop GIS and model meteorological, land-use and water management applications.

Community outreach is a key component of the Upper Mokelumne River Watershed Assessment and Project Plan as regular meetings request the public's contributions to the process. A newsletter was developed and mailed to stakeholder organization in the affected counties. Handbills were also posted at: Jackson, Sutter Creek, West Point, Pioneer, Barton and other smaller communities. Press releases were sent to local media. Scheduled for completion in 2008, impacts on water quantity, power revenue and water quality will be evaluated with varied land-use alternatives within the watershed, including land development and recreation in various areas, wildland fires and water and power operating conditions.

Access Control

Land Ownership. Landowners can control uses and activities on their land to avoid water supply contamination. Examples of appropriate controls including posting against trespassing, conservation of natural protective features, and adherence to sound waste disposal practices. The major landowners in the upper Mokelumne River Watershed are the Bureau of Land Management (BLM), Eldorado National Forest, Sierra Pacific Industries, Pacific Gas and Electric Company, and Stanislaus National Forest.

Fencing Restricted Watershed Areas/Riparian Lands. BLM does not have any riparian areas fenced to control access. Livestock control fences are present but these are designed for livestock management, and not to limit access.

Most of the fencing in Eldorado National Forest is between range allotments and some fencing is present within the allotments to prevent livestock from entering sensitive areas. However no single program exists which is designed to protect sensitive watershed areas and riparian lands. Each USFS District Ranger has the authority to restrict usage if a problem exists.

In Stanislaus National Forest, the Forest Service has access control measures in campgrounds that restrict vehicles from the riparian zone of Moore Creek, the North Fork of the Mokelumne near Moore Creek, and the North Fork of the Mokelumne near Ebbetts Pass (Bloomfield campground). This was done with fencing and large boulders as part of an ecosystem management program, the Coordinated Resource Management Areas (CRMA), to evaluate the current health of the watershed ecology and to evaluate what steps must be taken in the future to improve the ecology of the watershed.

Gating of Roadways. Gating of roadways prevents vehicular access but does not limit livestock access and only partially limits human access. A few gated roadways exist on BLM land in the Mokelumne River Watershed. They are generally placed to prevent driving into mining claims or for public safety.

Eldorado National Forest has an extensive system of gating of roadways. Access is restricted on roads for a variety of reasons. For example, some roads are closed except when needed for a particular project; some may be closed due to wildlife issues, and some are closed during winter.

It is estimated that over 80 percent of the roads entering Sierra Pacific land from the Stanislaus National Forest are gated. Very few roads on lands owned and operated exclusively by the Stanislaus National Forest are gated. However a large number of single purpose (timber harvesting) roads are present which are blocked until they are needed again (in 10 to 20 years). The gates that are present are rarely closed because most of them are in the snowbelt and are closed in winter by snow. However, due in part to the recent drought, the National Forest staff is re-evaluating its road closure policies and may be closing more roads in the future.

Hunting and Fishing Regulations. The California Department of Fish and Game (CDFG) issues licenses to regulate all fishing and hunting in the watershed. The seasons and limits on take are imposed by the CDFG Code by means of the licenses, and enforced by the CDFG wardens. While not designed to control soil and vegetation conservation and consequent water quality impacts per se, the regulations do serve to limit the extent and severity of such impacts by regulating the intensity of use and limiting the number of users to those willing to pay for licenses. CDFG also regulates any project that may impact a river, stream or lake and must be notified prior to the planning phase. Diversions, obstructions or changes in the natural flow or the streambed, channel or bank of a river are a few examples. In addition, using materials from a streambed or lake bottom or disposing debris or waste materials where it can pass into any river, stream or lake are also activities regulated by CDFG, and may require a permit prior to start of such activities.

Off-Road Vehicle Use Restrictions. The U.S. Forest Service imposes restrictions on off-road vehicles on the National Forest lands. All designated wilderness areas are off limits by Congressional designation. Other National Forest lands are closed due to the presence of unstable or devegetated soils, unstable roads and drainage systems, and sensitive biota such as spotted owl nesting pairs or rare plants. Closures may be permanent or seasonal; for example, designated areas may be open only to snow travel vehicles during the winter months.

Forest Plan Direction: Motor Vehicle Travel Management

This 2004 document supersedes previous OHV Management Practices. It provides management direction for motorized use on Stanislaus National Forest Lands. Goals for total managed off-highway vehicle miles are tabulated by ranger district and forest-wide standards and guidelines relating to closed and restricted motor vehicle management are presented. (see *Erosion Control* for examples). The document prescribes general direction for each management area. Management areas closed to motorized use include Wilderness and Proposed Wilderness, Proposed and Existing Wild and Scenic Rivers, Near Natural Areas, Research Natural Areas, and some Special Interest Areas. Restricted motor vehicle management is prescribed for the remaining areas.

The USFS is not funded to install gates to limit access; so notification is by means of forest orders, signs and maps. Violators are subject to citation by U.S. Forest Service rangers. Convictions can result in stiff penalties of up to $5,000 fine and/or six months in jail.

Wilderness Area Restrictions. Mokelumne wilderness is jointly administered by Eldorado and Stanislaus National Forests. The wilderness is protected by means of restrictions on activities and strict conformance with the wilderness land use designation. Human uses are basically limited to hiking, nature study and photography, horseback riding, backpacking, limited packtrain excursions, fishing, cross county skiing and mountaineering. No mechanized vehicles, including mountain bikes or snowmobiles, are permitted in the wilderness area.

Control is imposed by means of overnight permit requirements and issuance. At this time no restrictions on the number of permits or persons in each party are in place; however, such limits are being studied. Backpacking without a permit is a violation punishable by fine. Riparian lands, streams and water quality are further protected by means of restrictions on campsites and human waste disposal sites. Camps and latrines must be located at least 100 feet away from trails, lakes and stream courses. Stock animals are subject to further, more stringent restrictions on where they may be tethered, as well as tree and vegetation protection measures.

Rights-of-Way. BLM has many rights-of-way in the Mokelumne River Watershed. However, access is not restricted on any of the rights-of-way present on BLM land. Eldorado National Forest has "cooperative" roads, some of which have restricted access where they cross private land. Stanislaus National Forest has easements on lands owned by Sierra Pacific in two categories: limited and unlimited. Unlimited easements allow complete public access and limited easements allow access only for protection and management of Forest Service lands.

Ski Area Special Use Permits. The Mt. Reba - Bear Valley Ski Resort operates under a special use permit from the Stanislaus National Forest. Activities are limited to recreational skiing and the construction and maintenance of the necessary support facilities. Terms of the permit require any potentially adverse impacts of the development to be minimized or mitigated as fully as possible. An erosion control plan that includes requirements for revegetation/runoff control and slope stabilization is required for ski slopes.

Erosion Control

On National Forest lands, the U.S. Forest Service is primarily responsible for the control of erosion and other potential sources of pollution. Both the Eldorado and Stanislaus National Forests use the national standards and guidelines for these purposes, proposed best management practices developed by the State of California's Department of Forestry and Fire Protection, and their own Land and Resource Management Plans. Included among these regulations are limitations on operations in stream protection zones, on steep or unstable slopes, and during wet weather conditions. Very little quantitative data is available for the National Forest lands.

The 2004 SNFPA defines a strategy for attaining desired conditions in aquatic, riparian, and meadow ecosystems. These goals especially pertinent to water quality are listed below:

- Water Quality: Maintain and restore water quality to meet goals of the Clean Water Act and Safe Drinking Water Act, providing water that is fishable, swimmable, and suitable for drinking water after normal treatment.

- Watershed Condition: Maintain and restore soils with favorable infiltration characteristics and diverse vegetative cover to absorb and filter precipitation and to sustain favorable conditions of stream flows.

- Stream Banks and Shorelines: Maintain and restore the physical structure and condition of stream banks and shorelines to minimize erosion and sustain desired habitat diversity.

Guidelines and standards in the 2004 SNFPA prohibit or mitigate ground-disturbing activities within RCAs and CRMAs. Guidelines direct forest staff to prevent disturbance to streambanks and shorelines (see Grazing section), minimize exposure of bare soil during post-fire treatments, ensure existing roads and skid trails meet BMPs, and restore in areas with excess compaction and gullying.

As mentioned in the Access Control section, the Forest Plan Direction: Motor Vehicle Travel Management published in 2004 supersedes previous OHV Management Practices for Stanislaus National. Lands. Guidelines and standards are provided to limit erosion, monitor conditions, and for rehabilitation. For example, the guidelines for Restricted Motor Vehicle Management include encouraging users to seek opportunities for hill-climbs and motocross events on lands other than National Forest, and to use Adopt-a-Trail programs to maintain routes, and to maintain and update the Forest OHV mailing list and make related information available to the public. The document also contains a monitoring and evaluation plan for OHV trails to update the condition rating (green=ok, brown=needs maintenance, orange=needs major attention).

On private lands, the California Department of Forestry and Fire Protection is responsible for enforcing the regulations of the California Forest Practices Act to control erosion impacts. The regulations require submittal and advance approval of Timber Harvest Plans for all significant harvesting efforts for each three-year time segment.

Amador County Grading Ordinance – Revised November 20, 2003

Amador County requires all projects that move more than 50 cy of grading to obtain a Grading Permit. Projects exceeding 5000 cy, are defined as engineered grading and require a soils engineering and an engineering geology report. All plans must comply with standards set by NPDES Storm Water Prevention Requirements. Projects exceeding one acre must file Notice of Intent (NOI) with the RWQCB and provide a Storm Water Pollution Prevention Plan. The grading ordinance requires all projects to provide plans for prevention of erosion that may exceed levels prior to the start of the project. Furthermore, projects undertaken during the rainy season must submit erosion control plans and receive approval prior to Oct. 15. Erosion control plans must include revegetation and drainage structures to control erosion and sedimentation.

The grading permits are issued in three ways:

1. Over-the-counter for projects not exceeding 250 cy;
2. Issued with the building and septic permit; or
3. If none of the above, issued by Public Works

Stanislaus Forest Scale Roads Analysis

This document discusses effects of roads on watershed ecosystems, defines Stanislaus NFS priorities in road construction, and provides guidelines road analyses. It states that the inventory of hydrologically connected segments on the road system on the Stanislaus National Forest is largely incomplete. A more intensive inventory is essential in developing an improvement plan to address the effects of roads on the watershed. The Stanislaus GIS library contains erosion data that may be used in conjunction with road system maps for effective road management planning. One guideline established in the Central Stanislaus Watershed Analysis establishes a desired density of less than 2.5 miles of road per square mile. This guideline leaves room for further road development and improvements. Additional guidelines in this document are included for planning and accomplishing needed road development, reconstruction, maintenance, and decommissioning.

Pest Management

Pest management typically includes management practices for nuisance vegetation control, mosquito control, rodent control, or pesticide spraying for agricultural needs. These practices rely quite heavily on the use of pesticides and herbicides. The water quality concerns associated with pesticide and herbicide uses were discussed in Section 5. Because agricultural lands constitute a small area of the watershed lands, any associated pesticide spraying is not of significant concern. There are no active programs within the watershed lands for mosquito or rodent abatement, nor aerial pesticide spraying.

Any property owner or operator who wishes to use a pesticide designated as a "Restricted Material" on a specific crop or site must first obtain a Restricted Materials Permit from the county agricultural commissioner. A list of restricted materials is found in Title 3, California Code of Regulations, Section 6400. Restricted materials are those pesticides which the Director of the California Environmental Protection Agency finds to be a potential hazard to public health, pesticide applicators, field workers, domestic animals, crops, or to wildlife and the environment in general, as determined by the Department of Pesticide Regulation. The County Agricultural Commissioner enforces pesticide laws and regulations at the local level. Prior to issuing a permit to possess or use a restricted material, each County Agricultural Commissioner shall determine if a significant adverse environmental impact may result from the use of the pesticide.

There are two types of permits an applicant may obtain. The first is an agricultural permit that is to be used for agricultural purposes such as the production of food, feed and fiber; or the maintenance of golf courses, parks, cemeteries, or right-of-ways. The second type of permit is for non-agricultural uses, which include industrial and institutional uses. Amador County is considering creating a Vector Control Department to control mosquitoes to stem the threat of West Nile Virus.

Logging Practices

National Forest timber which includes trees, portions of trees, and other forest products on National Forest System lands, may be disposed of for administrative use by sale or without a charge, as may be most advantageous to the United States. Most of the wood products that may be disposed of for administrative use are in the form of personal wood fuels; permits are subject to a maximum quantity set for each National Forest.

The USFS will insure that each permit for timber use is consistent with applicable land and resource management plans and environmental quality standards. The key factors include:

- Fire protection and suppression.
- Minimizing additional soil erosion.
- Insuring favorable conditions of water flow and quality.
- Protection of residual timber.
- Regeneration of timber.

The Code of Federal Regulations prescribes the manner in, and extent to which, timber sales and uses will be conducted, and specifies the conditions of the sale or use and/or the cancellation of same.

Timber owners or operators who propose to cut and remove solid-wood forest products of designated live commercial forest trees from non-federal timber lands must first submit a timber harvesting plan (THP) to the California Department of Forestry and Fire Protection for approval. Timber owners include persons who own timber or timber rights on lands owned by another party. Solid-wood forest products include sawlogs, veneer logs, poles, pilings, timbers, posts, tanbark, chips, fuel woods, split products, root-crown burls, and pulp-logs. Timberland is non-federally owned land capable of bearing designated commercial forest tree species. Designated commercial forest tree species vary between regions.

The California Department of Forestry and Fire Protection approves THPs to assure that timber operators carry out their activities in keeping with the goal of maximum, sustained timber production while considering maintenance of recreational opportunities, watershed quality, wildlife, range, forage, and fisheries. During this update period, the Central Valley Water Quality Control Board has adopted new rules to now require a discharge waiver for all THPs and all Emergency harvest operations. They are taking a more active role in proposing additional mitigation measures at the time of THP review and approval, and are usually attending pre-harvest inspections of THP areas.

Sierra Pacific Industries (SPI) conducted watershed assessment and their report concluded that 13 of 26 planning watersheds owned by SPI had high susceptibility to erosion. As a result of this assessment, Sierra Pacific developed integrated management recommendations pertaining to new timber harvests, forest practices, restoration strategies, landscape management, and monitoring and adaptive management. SPI is continuing to reduce erosion from forest roads, skid trails and landings. This is done by increasing the amount of crossing repairs and replacements--specifically culverts, rocked-low water crossings, and bridges, and increasing the amount of road rocking nearby streams and watercourses. Other techniques (such as the placement of filtering strawbales, straw wattles, and mulching techniques) are also used when working in proximity to streams.

The U.S. Bureau of Land Management (BLM) requires one or more "Use" Authorization Permits for activities that may impact vegetation. Under the BLM forestry program, a contract is required for removal of timber and other vegetation resources for commercial or domestic use. Timber includes saw timber, fuel wood, poles, posts, and any standing trees, downed trees or logs capable of being measured in board feet. Other vegetative resources include Christmas trees, cones, boughs, manzanita, moss, and many other unspecified products which are salable.

Uses and projects, such as new road construction or use of existing roads for commercial hauling of private timber across BLM land, require issuance of right-of-way grants or temporary use permits from BLM. Such uses include access roads, utility lines, communication sites, or any other uses that involve the placement of either temporary or permanent improvements upon BLM lands. In addition, any activity that involves physical disturbance to the land or vegetation requires a permit (e.g., brush removal or test hole drilling). Other long-term occupancy or use of BLM land that could affect vegetation may also be authorized by a lease. Applications must be filed with the local BLM office.

Timberland Conversion

Any person who owns timberlands which are to be devoted to uses other than the growing of timber, or who applies for immediate rezoning from Timberland Production Zone (TPZ) whether timber operations are involved or not, must obtain a Timberland Conversion Permit from the Director of the Department of Forestry and Fire Protection. Examples of activities requiring a Timberland Conversion Permit include development of a ski area or other development of recreational facilities, the construction of a housing development, changing the designation of timberland to grazing land, or applying for immediate rezoning from TPZ.

The Director of the California Department of Forestry and Fire Protection evaluates applications for Timberland Conversion Permits to assure that the proposed timberland conversion meets the requirements of the Forest Practices Act, related Board of Forestry regulations, and provisions, rules, and regulations requiring stocking for continued forest production, or to enable a county to finalize approval of immediate rezoning from TPZ.

Owners proposing a conversion of a timber stand of less than three acres within a single ownership to other uses need not obtain a Timberland Conversion Permit if the conversion conforms to the local general plan and zoning ordinances. Timber owners may not use this exemption more than once for a parcel in a single ownership. Public agencies proposing to convert timberland to construct rights-of-way across public property, and landowners granting easements for constructing and maintaining utility transmission lines need not obtain a Timberland Conversion Permit. Additionally, landowners who have satisfied all local CEQA requirements for a subdivision development are exempt from Timberland Conversion Permit requirements.

Grazing and Livestock Management

All grazing and livestock use on National Forest System Lands, and on other lands under Forest Service control, must be authorized by a Grazing or Livestock Uses Permit. The Code of Federal Regulations (CFR) sets the rules under which livestock operations will be conducted in order to meet the multiple-use, sustained yield, economic, and other needs and objectives for the lands involved. Allotment Management Plans prescribe the manner in, and extent to which, these operations will be carried out on a site-specific basis, to minimize environmental and water quality impacts. The use of Bureau of Land Management lands for grazing or any livestock use requires the issuance of a grazing lease.

The 2004 Sierra Nevada Forest Plan (SNFP) Record of Decision (ROD) specifies grazing limitations to promote hardwood regeneration, and specifies management goals for pounds of residual dry matter (RDM) acre on grazed grasslands to ensure ecosystem health. For grazing allotments in occupied willow flycatcher sites, only late season (after August 15) grazing is allowed. If, upon evaluation, the habitat is deemed degraded, restoration projects shall be implemented which may include reducing or eliminating grazing areas. When re-issuing grazing permits near riparian zones, the compatibility of livestock with riparian conservation objectives are evaluated. Goals for season-long grazing included limiting livestock utilization to 30 or 40 percent for early and late seral status meadows respectively, and limiting disturbance to no more than 20 percent of streambanks and shorelines, or 10 percent in stream reached identified as “essential habitat.”

Mineral Exploration and Mining

Title 36, Section 228 of the CFR sets the rules and procedures through which the surface of National Forest System Land may be used in conjunction with operations authorized by the United States Mining and Mineral leasing laws, and the sale of mineral materials. Hard rock mineral leasing on National Forest System administered lands is subject to 43 CFR 3500.

Mineral development on, or requiring access across, lands under the management of BLM will require one or more "use" authorization permits issued by the BLM. Categories of permits include locatable minerals, leasable minerals, salable minerals (which include oil and gas, and geothermal).

Stormwater Management

The water quality concerns associated with stormwater are detailed in Section 5. In general, the concerns identified with urban stormwater include organics, inorganics, microbes, and occasionally turbidity. The first storms of the rainy season have the potential for transporting unusually high concentrations of numerous water quality parameters. These elevated concentrations in turn create both reservoir and treatment-related concerns. Given that few urban areas are within Amador and Calaveras County watersheds, their stormwater management programs are focussed on grading and construction for source water protection.

The State Water Resources Control Board (SWRCB) has developed a General Construction Activity Stormwater Permit for stormwater runoff associated with any construction activity including clearing, grading, excavation, reconstruction, and dredge and fill activities that result in the disturbance of at least five acres of total area.

Discharges composed entirely of industrial stormwater runoff may be eligible for coverage under a General Industrial Stormwater Permit issued by SWRCB rather than an individual permit issued by the Regional Board. Eligible activities include:

- Facilities subject to stormwater effluent guidelines (40 CFR subchapter N).
- Manufacturing facilities.
- Mining facilities.
- Hazardous waste treatment, storage, or disposal facilities.
- Landfills, land application sites, and open dumps that receive industrial waste.
- Recycling facilities such as metal scrap yards, battery reclamation sites, salvage yards, and automobile yards.
- Transportation facilities.
- Sewage treatment plants.
- Certain stormwater discharge facilities.

In June 2001, Pardee Center obtained a NPDES Industrial Storm Water Permit from the California Regional Water Quality Control Board for operations associated with the Pardee lime facility. The District developed and implemented a Storm Water Pollution Prevention Plan and a Monitoring and Reporting Program in compliance with the permit conditions. Samples have been collected twice per year since 2001 and the District has been in compliance with all permit conditions since obtaining the permit. A clean up of the abandoned Pardee Lime Tower in May 2005 removed the only significant source of potential storm water contamination from the site removing any potential environmental impact from the facility. The District is in the process of request removal from the storm water program in 2006.

Caltrans Storm Water Management Program: Annual Report (2003-2004)

Caltrans must comply with the regulations and policies established in its own Statewide Storm Water Management Program (SWMP) and the NPDES Permit. As part of the program management, Storm Water Advisory Teams (SWAT) were created for the following areas of Caltrans' operations: water quality, project design, construction, maintenance, and encroachment. The basic functions of the teams are to:

- Design procedures and guidance for the implementation of the SWMP;
- Gather and disseminate information on new or updated regulations or policies, and;
- Review and improve BMPs.

The SWMP and NPDES permit require Caltrans to provide an annual status report on storm water treatment technology and characterization programs. Caltrans identifies and screens candidate BMPs for future pilot studies and research. The Storm Water Treatment BMP Technology Report provides information on the new technologies not yet approved. Six new technologies have been approved during the 2003-2004 reporting period and are listed under the SWMP.

Caltrans fulfills the permit requirements through storm water management throughout the entire project delivery process. Design pollution BMPs are incorporated in all new projects or expansions. Innovative design approaches are coordinated with the Monitoring and Research Program within the Environmental Division to evaluate their performance.

Treatment BMPs are considered in all three phases of the project:

1) Project Initiation Document (PID);
2) Project Assessment/Environmental Document (PA/ED), and;
3) Plans, Specification and Estimates (PS&E).

Implementation of the treatment BMPs will be based on the Storm Water Data Report (SWDR) performed for all three phases.

The Division of Construction developed and issued five new manuals:

1) Storm Water Management Enforcement Manual
2) Construction Storm Water Coordinators Guidance Manual
3) Construction Site Storm Water Quality Sampling Guidance Manual

4) Storm Water Pollution Prevention Plan (SWPPP)/Water Pollution Control Plan (WPCP) Review Guidance Manual
5) Guidance for Temporary Soil Stabilization field manual

The SWMP describes annual inspection and cleaning of culverts, drains, inlets, gutters, and downdrains as necessary. Caltrans has a vegetative control program based on integrated pest management principals. The main goal of the program is to reduce use of herbicides wherever possible. The SWMP prohibits use of chemical vegetative control unless directed by the California Depart of Food and Agriculture to eliminate invasive weeds.

Caltrans' Monitoring and Research Program provides information on storm water pollution, evaluates BMPs, fulfills the requirements of the SWMP and NPDES Permit, and characterizes runoffs from Caltrans' facilities.

Waste Management

Discharge Requirements. The owner or operator of any facility or activity which discharges or will discharge waste that may affect groundwater quality, or from which waste may be discharged in a diffused manner (e.g., erosion from soil disturbance) must first obtain waste discharge requirements from the Central RWQCB.

The Regional Board issues NPDES permits and adopts waste discharge requirements to protect the waters of the state for all designated beneficial uses in the watershed. The State Water Resources Control Board (SWRCB) and Regional Board seek to attain the highest possible water quality in the state. Examples of activities that may require an NPDES permit include:

- Feedlots for cattle, swine, sheep, goats, horses, turkeys, chickens, and ducks.
- Sewage treatment plants.
- Stormwater runoff discharges (municipal, industrial, and construction).
- Dredge spoils discharges.
- Mining activities.
- Groundwater discharge operations.

Examples of the types of wastes that may require waste discharge requirements are:

- Drainage from agricultural operations.
- Drainage from waste materials in landfills.
- Flow or seepage containing debris or eroded earth from logging operations.
- Drainage from inoperative and abandoned mines.
- Waste from construction or dredging operations.
- Food production and processing wastes.
- Waste from manufacturing and refining operations.
- Municipal and industrial wastes, if percolation or injection to groundwater are the disposal methods to be utilized.

The discharge of waste into a municipal sewer system is not usually subject to waste discharge requirements. However, USEPA, SWRCB, the Regional Board, and the local wastewater management agency may require some industries to pretreat hazardous wastes prior to discharge to the municipal sewer system. The local wastewater management agency will notify the industry of the requirements. Waste disposal by injection well also may be subject to a Federal Underground Injection Control Program Permit issued by usEPA.

The Regional Board evaluates the "Report of Waste Discharge" to determine whether the proposed discharge is consistent with the Regional Board's adopted water quality standards, the Areawide Waste Treatment Management ("208") Plan, the Water Quality Control Plan (Basin Plan) for the area in which the proposed activity is located, and the "Chapter 15" regulations, if applicable.

Septic Tank Regulations. Only approximately 1 percent of the land use in the Mokelumne River Watershed is residential. Because of the close proximity of many residential areas to creeks and other waterways, poorly functioning or situated septic systems present a major potential source of contamination to the Mokelumne River system and Pardee Reservoir.

Signed into law in 2000, AB885 authorized regulation of on-site wastewater treatment systems (OWTS) through the SWRCB, which is releasing a draft EIR in early 2006 for implementation in 2007. Proposed regulations will require: an operation permit for new systems dispersing under-pressure, at-grade or above-ground, permits for new or replacement OWTSs, effluent concentration and dispersal solids size limitations, designer, operator and evaluator professional certification, inspection of septic tank by qualified provider upon property ownership change, groundwater monitoring in vicinity of the OWTS discharge and installation of supplemental treatment systems to meet effluent limitations. Though intended for state-wide application, implementation will be contingent upon the resources available for each county. The upgrade requirement for installation of supplemental treatment systems to meet effluent limitations will most likely apply to OWTS within 600 feet of an impaired waterbody on the 303(d) list.

In Calaveras County, individual septic tanks fall under the jurisdiction of the Building Department, On-Site Sewage Division. The regulations for septic systems in Calaveras County pertain only to the installation of new systems. No regulations or management of existing systems are present, although the County is aware that maintenance regulations are needed and are working to that end.

In Amador County, the County Health Department regulates the siting, design, construction and performance of septic systems. In Alpine County, an extensive set of guidelines and procedures are present to obtain a permit to construct, alter or repair a septic system in accordance with Alpine County Health Department Regulations. These regulations cover siting, construction, and performance standards.

Underground Tanks and Chemical/Fuel Storage. The underground tank law established state regulations requiring permits to be issued by the RWQCB to underground tank owners. A developer-applicant will need this permit if they own, operate, or intend to construct an underground storage tank containing a hazardous substance.

All new underground storage tanks must provide primary and secondary containment for the hazardous substances stored. The primary container must be product-tight under all circumstances (i.e., impervious to the substance it contains). Secondary containment must be constructed to prevent structural weakening as a result of contact with any released hazardous substances, and also shall be capable of storing the hazardous substances for the maximum anticipated period of time necessary for the recovery of any released hazardous substance. An access casing is required in the secondary container for installation of the monitoring system to detect unauthorized releases and provide a conduit for removal of the hazardous substance.

To protect water quality statewide, standards have been established for monitoring underground storage tanks that store hazardous substances. The objective of the monitoring program is to detect any unauthorized release from any portion of the underground storage tank system at the earliest possible opportunity. If the monitoring detects an apparent unauthorized release, the actions to be taken will be governed by the provisions of Chapter 16 of Division 3, Title 23, California Code of Regulations, which regulates underground tanks. Specific procedures are required for reporting unauthorized releases. All unauthorized releases must be reported to local agencies by underground storage tank owners or operators.

A non-pressurized underground motor vehicle fuel storage tank may be repaired once by the operator. The tank owner must demonstrate to the local agency that all of the problems have been identified and that the proposed repair will correct them. A test or inspection must then be performed to determine if the underground storage tank is structurally sound. Repairs are required to be performed, using accepted engineering practices, with materials that are compatible with the underground storage tank and with the hazardous substance(s) being stored. All repaired tanks must be retrofitted with cathodic protection and overspill prevention. Following the repair, the underground storage tank owner must demonstrate that the repair was successful and that the underground storage tank will meet the applicable containment.

Certain specific actions and evaluations must be completed by the underground storage tank owner when the underground storage tank is either temporarily or permanently taken out of service. Temporary closure allows an underground storage tank to be taken out of service for up to one year without implementing permanent closure. Leaking underground storage tanks must be repaired or permanently closed.

Land Disposal Regulations. Many of the larger communities in Calaveras County utilize wastewater treatment systems, which collect sewage from septic tanks and transport the effluent to community treatment facilities. After treatment, wastewater is disposed of on land. Land disposal of treated wastewater in Calaveras County is regulated by the Central Valley RWQCB. Discharge requirements are specific to individual sanitary districts, but the RWQCB is attempting to update and standardize all discharge requirements. An example of discharge requirement for Pardee Center WWTP is shown in Appendix D.

Calaveras County Groundwater Protection Plan

The Calaveras County Environmental Health Department (Department) is the designated Local Primary Agency to carry out the Federal and California Safe Drinking Water Acts. Groundwater is a major focus of the Department since it is a significant source of potable water. As part of plan, the Department will inspected, mapped, plotted and tabulated data on:

- Class V injection wells
- Well Program including Domestic and Salt Water Wells
- Small Public Water Systems, including Drinking Water Source Assessment and Protection Program element
- On-Site Septic Failures and Installation
- Solid Waste Sites
- Ground water source adversely affecting surface waters

Since the adoption of the Surface Water Treatment Rule, small public water systems (<200 connection) have been encouraged to use groundwater. Around 75% of homes and 20% of businesses in Calaveras County utilize on-site septic sewage disposal. On-site septic sewage design, placement and installation are regulated by the Calaveras County Building Department. These septic system presents a potential problem to surface waters when these systems breakdown. When a failure is reported, bacteriological analyses must be done to determine origin and level of contamination by coliform counts. Owner must contact On-Site Sewage Division of the County Building Department for repair or replacement.

The Department recorded occurrence of salt springs in and around the Salt Springs Valley to better monitor effects on surface water salinity. Also, salt infiltrated the surface water from the developments of wells throughout the county.

Groundwater mixing with the metals and chemicals in mines adversely leach out acidic, metal-heavy water into the surface waters, of which Penn Mine was an example. It contributed to fish kills in Mokelumne River and required an expensive cleanup. Royal Mountain King Gold Mine in Salt Spring Valley also presents potential problems with naturally-occurring salts. Under the Calaveras County Well Construction Ordinance, all abandoned wells are required to be destroyed under permit to protect ground water and surface water.

Structures, Dredging and Fill Management

Any person or public agency proposing to locate a structure, excavate, or discharge dredged or fill material into waters of the United States must obtain a Section 404 Dredged Material Discharge or Fill Material Placement Permit from the U.S. Army Corps of Engineers' (USACE). Typical activities requiring permits include the construction or installation of artificial canals, artificial islands, boat ramps, breakwaters, bulkheads, dams, dikes, weirs, groins and jetties, intake pipes, levees, mooring buoys, outfall pipes, overhead power crossings, pipes and cables, piers and wharves, riprap, road fills, signs, and tunnels; or activities that result in dredging or filling, or the discharge of sand, gravel, dirt, clay, and stone.

The Federal Rivers and Harbors Act of 1899, and Section 404 of the Clean Water Act grant the USACE jurisdiction over all navigable waters within the United States. Recent legislation and court decisions have expanded the legal definition of navigable waters to include marshes, swamps, and diked lands, even though they may not, in fact, be navigable.

The decision whether to grant or deny a permit is based on a public interest review of the probable impacts of the proposed activity and its intended use. Benefits and detriments are balanced by considering effects on such concerns as: conservation, economics, wetlands, fish and wildlife values, flood hazards, navigation, water quality and the needs and welfare of the people. In addition, projects involving discharge or dredge or fill material must comply with the Section 404(b)(1) guidelines prepared by the Environmental Protection Agency. The guidelines restrict discharges into aquatic areas when there are less environmentally damaging, practicable alternatives. Reasonable and practicable mitigation of unavoidable impacts also will be required. A permit will be granted unless the project is found to be contrary to the public interest or fails to comply with the guidelines.

The USACE is required by federal law to consult with state and federal wildlife agencies regarding any impacts of a project on aquatic habitats.

Inspection, Surveillance, and Enforcement Procedures

The District's programs for inspection, surveillance, and enforcement are described in the "EBMUD" portion of this section.

Emergency Response

Depending upon the type of emergency, any number of water quality contaminants may impact source water quality including turbidity, microbes, organics, and inorganics. Of particular concern are emergency scenarios that could result in contaminants being introduced within close proximity to a reservoir outlet tower. The District's Emergency Operations Plan describes the overall District emergency management program through a phased approach: preparedness, alert and warning, activation of emergency operations plan, District notification, partial and full response, and recovery. The Basic Plan responds to a broad range of emergency scenarios. Three standard emergency ratings classify the magnitude and scope of emergency response required by the event:

- Level I: Minor Emergency (e.g. aqueduct failure or local freeze)
- Level II: Major Emergency (e.g. moderate earthquake (like 1989 Loma Prieta), or widespread and long-term power outage)
- Level III: Catastrophic Emergency (e.g. major earthquake, fire, flooding)

The emergency response plan summarizes potential hazards facing the District: earthquake, aqueduct or levee failure, dam failure, hazardous materials spill or leak, major fires, severe storm or flood, civil disturbance, contamination of water supplies, sewage spill, widespread power outage, and national security emergency. The plan establishes the emergency response structure - systems are laid out, and specific responses and activities are outlined.

The District rangers are classified by the state as "wildland firefighters" and have the responsibility for initial response and mop-up of all fires on District-owned lands. In addition, they have the responsibility for fire road grading and maintenance, and fire prevention activities in accordance with the Annual Fire Plan.

During a major disaster, the District operates as part of the Statewide Emergency Management System. Local cities, special districts, counties, mutual aid regions, and state agencies participate in this response. In a disaster, natural or man-caused, the District activates its Emergency Operations team (EOT), opens its Emergency Operations Center (EOC) in Oakland, and may activate Area Incident Command (AIC) and/or Field Operations Centers (FOC). EBMUD uses the Incident Command System (ICS) to standardize response, and in early 2005 is integrating the National Incident Management System (NIMS) to provide clear communication, coordination, and direction with other first-responder agencies during emergencies.. In addition, each division or department develops and updates an emergency plan with details on response priorities, staff assignments, and emergency resources. These department/division plans are updated on an annual basis.

The Regional Water Quality Control Board, CDFG, Caltrans, and Department of Health Services have responsibilities to mobilize personnel to oversee responses and cleanup following any spillages or releases of hazardous materials. If the situation should become a major crisis, the State Office of Emergency Services may step in to coordinate the overall emergency response, public notification and evaluation, and cleanup and abatement efforts.

Public Education

The Environmental Health Department of Amador County advises businesses individually on managing their hazardous waste and controlling pollutants. The County maintains three household hazardous waste disposal sites and has developed a brochure on this topic. Residents can dispose of latex paints, used oil and depleted batteries at these sites. County public schools have presented students with information on appropriate recycling and recycling practices, groundwater contamination prevention, and composting. Proper construction specifications and maintenance are reviewed with residential septic system applicants by County personnel. Radio station KNGT-FM in Amador County broadcasts a weekly segment on recycling developed by the Solid Waste Department. Appropriate recycling practices are presented (e.g., don't dump oil down storm drains) as well as the proper use and disposal of toxic household products.

The Amador County Farm Bureau co-sponsors workshops with the County Agricultural Commissioner in English and Spanish on the proper use and disposal/discharge of pesticides. An "Ag" Clean Up Day was conducted in March 2003 to dispose of disallowed and excess chemicals. Both Amador and Calaveras counties participated; and an independent agency was hired to collect and dispose of the chemicals by incineration.

Alpine County has no specific program for public education. They do produce a newsletter, the "Alpiner" which covers a variety of topics including recycling.

Calaveras County has not implemented any public education activities, but the Health Department hopes to develop materials in the future. Neither the County Farm Bureau nor the U.C. Extension Farm Advisor has conducted any public education efforts.

The District has recognized since the early 1970's that water suppliers have an obligation, as managers of an essential natural resource, to educate the public to conserve and protect that resource. Environmental education is a key component of the District's Public Information Division and for their Natural Resources Department. The District is a co-sponsor at both Amador and Calaveras County Fairs. The District is a leader in providing curricular materials to schools on the subjects of protecting and conserving the water supply. In addition, the District provides ranger-naturalists to visit classrooms or to lead field trips to District reservoirs and watershed lands.

The Stanislaus National Forest has begun erecting informational signs to help restrict access to riparian areas. They have placed signs and provided other educational material for the public informing them of the need to prevent livestock access to areas with steep slopes, fragile vegetation and sensitive riparian areas. The Eldorado National Forest has maps and other information to instruct the public about sensitive resources and designated trails.

BLM has a program ("Outreach") whereby specialists are available to talk to schools when requested. BLM also participates in County fairs to answer questions from the public.

Fire and Fuels Management

National Forests

In the 2004 Sierra Nevada Forest Plan Amendment (SNFPA), described earlier, first emphasis on fire and fuels management was placed on reducing fuels in the wildland urban interface (WUI), with a goal that 50% of initial fuel treatments are to be located in the WUI until all treatments in the WUI have been completed. The strategy of the 2004 SNFPA is based on the premise that disconnected fuel treatment areas overlapping across the general direction of fire spread will change fire spread, and thus only a fraction of the acreage needs to be treated to yield desirable modifications to wildfire behavior. In essence, the SNFPA allows for fewer fuel treatments and less disturbance of the land. The 2004 SNFPA notes that only 0.3% of the standing inventory will be removed each year, which amounts to only 1/5 of the annual net growth. Thus there is a net accumulation of fuel. The ROD recognizes the need for a better public understanding of the need to thin the forests.

The SNFPA lists guidelines for fuel management projects, and prescribes standards that reduce the impacts on habitat as defined by Home Range Core Areas and Protected Activity Centers, Riparian Conservation Areas, and Critical Aquatic Refuges. California Spotted Owl and northern goshawk habitat especially place restrictions on fuel management activities.

The SNFPA also defines strategies for restoration of ecosystems after events such as the 2004 Power Fire. Specific consideration for long-term fuel profiles, erosion control, and water quality are to be included in restoration plans.

Power Fire Restoration: Final Environmental Impact Statement

The 2004 SNFPA provides direction on restoration following a catastrophic event such as the 2004 Power Fire. The EIS proposes actions to treat fire-killed and damaged trees to increase ground cover, reduce the effects of future fire, provide for public and worker safety, and recover economic value of the trees. The proposed action is for approximately 8,900 acres within the 17,000-acre burned area. Under the proposed action all dead and dying trees in the Mokelumne Wilderness and areas that experienced low-intensity burn would be retained, and snags would be retained in variable numbers in riparian conservation areas. Roadside hazard trees would be removed, and salvage logging would occur using helicopter, skyline, and ground-based machinery. Near streams such as Beaver and Panther Creek, 150-foot exclusion zones for equipment would be maintained, and temporary roads and landings would be placed at least 300 feet from perennial streams. Woody debris (slash cover) would be left on the ground following salvage logging, resulting in effective ground cover of approximately 40% in high burn severity areas.

With the proposed action area, approximately 28 miles of roads would be reconstructed. Stream crossings would be rocked, and the existing road system would be improved, reducing chronic sources of sedimentation. Slash cover on hillslopes could decrease sediment loads to streams, and the most hydrologically sensitive areas and steep slopes would be protected through exclusion zones. Roads would be reconstructed and maintained to improve watershed condition.

Amador County Fire Reduction Plan

The rapid growth of communities expands the extent of the WUI. At this boundary, building and structures are brought closer to areas of high fuel loading and fire risk. To reduce fuel and fire risk, the Amador County Fire Hazard Reduction Plans provides foundation for justifying and prioritizing future fuel reduction projects throughout the county in the next five years. The plan focuses on eight lower administration units and excludes the Up-Country Administration Unit (eastern portion of county), because it is currently managed by professional fire management personnel from USFS and Sierra Pacific Industries (SPI). The plan primarily relies on a vegetative management strategy consisting of the development of shaded fuelbreaks and roadside clearing of vegetation to control fuel and fire risks.

Shaded fuelbreaks are areas where overstory crowns are trimmed and surface and ladder fuels are reduced or completely removed to establish discontinuity in available fuel and the first line of defense against a fire outbreak. Methods of prevention and control may involve the use herbicides, prescribed burning, mastication and grazing.

Roadside clearing will focus on maintaining accessibility during fires to paved roads used for evacuation, fire response, and fuelbreak development. Main goals will consist of establishing clearings of 25-50 ft width from road's edge, removing all brush and trees less than 8 ft from road's edge, pruning trees to at least 10 ft, and spacing trees to maximum allowed by property owners.

Projects were identified in each of the eight administrative units and prioritized according the fuel hazard rank, probability of fire, and the housing density near WUI. Top priorities were established in conjunction with CDF. Future projects will be prioritize according to available funds, community participation, changes in fuel conditions due to fire and vegetative growth, and location of fuel reduction projects from other state and federal agencies.

Stanislaus National Forest Fire Management Plan

The Stanislaus National Forest Fire Management Plan (FMP) is operational document that implements the recommendations determined by the Stanislaus National Forest Land and Resource Management Plan (LRMP). The objectives of the plans are to reduce the amount and intensity of severe wildland fires, reintroduce fire into fire-dependant ecosystem (if appropriate), and reduce the threat of wildland fires to human communities and natural resource.

Wildland fire will be suppressed if they are human-caused or if protection objective is required. Strategies of response are outlined in Section IV of the FMP. Naturally occurring wildland fires will be allowed if they meet beneficial resource management objectives. A Wildland Fire Implementation Plan must be approved for any wildland fire use.

Fuel and vegetation management will be use to treat landscapes to meet resource management objectives, such as reintroducing fuel for wildland fire use, establishing defensive fuel profile and reducing fuel in zones near communities and other valuable resources.

Fuel and vegetation management can consist of:

- Prescribed fire to manage natural and activity fuels for the establishment of fuel profiles for cost-effective fire suppression, or;
- Non-fire or mechanical treatments to disrupt continuity of fuels, removing large fuels, and selectively treat large areas.

Three Fire Management Units (FMU) were defined to meet different management objectives within each area according to the resources to be protected, fire and fuel characteristic, and management and operational strategy.

Table 6-1: Agencies with Influence Over Source Water Quality

Agency	Jurisdiction or Issues of Concern
Local / Regional Agencies	
EBMUD	Management of water supply, quality, treatment, and distribution.
	Collection, treatment, and disposal of wastewater
Counties of Alpine, Amador, Calaveras, and San Joaquin	Regulation and monitoring of agricultural pesticide usage. Control of animal and plant pests.
	Inspection of hazardous materials storage and underground storage tanks.
	Fire protection, storage of hazardous materials, emergency response.
	Stormwater collection and disposal.
	Management of natural resources.
	Emergency planning and response.
	General plan/zoning land use changes, use permits, environmental compliance.
	Construction and maintenance of county roads--vegetation management and erosion control.
	Transportation planning and traffic control.
	Development services /building permits.
	Hazardous materials business plan.
	Collection, treatment and disposal of wastewater, septic system permits.
Sierra-Pacific Industries	Management of forests – planting and logging.
	Management of associated facilities -- roads, timber processing plant, administrative & maintenance buildings.
PG&E	Management of hydroelectric facilities.
	Management of associated facilities -- water transmission, water quality, roads, administrative buildings, recreation sites.
Amador Water Agency	Management of water supply, quality, treatment, and distribution.
Calaveras County Public Utility District	Management of water supply, quality, treatment, and distribution.
Calaveras County Water District	Management of water supply, quality, treatment, and distribution.
Jackson Valley Irrigation District	Management of water supply, quality, treatment, and distribution.

Table 6-1: Agencies with Influence Over Source Water Quality – (continued)

Agency	Jurisdiction or Issues of Concern
State Agencies	
Caltrans - CA Department of Transportation	Construction and maintenance of state and federal roads
	Stormwater collection along state and federal roads
	Hazardous materials spill response and maintenance of spill records along state and federal rights-of-way
CA Department of Fish and Game	Protection of state listed species
	Monitoring of water quality for aquatic species
	Regulation of alterations to natural state of rivers, streams, or lakes.
CA Department of Forestry and Fire Prevention	Fire prevention and suppression on all state-responsible lands (includes all District-owned watershed lands, except Lafayette Watershed)
	Regulation of timber harvesting activity on private lands
CA Department of Health Services	Primacy for setting safe drinking water standards
	Protection of drinking water supplies
	Regulation of public water supply, treatment, and distribution systems
CA Department of Toxic Substances Control	Regulation of hazardous waste generation and storage
CA Office of Emergency Services	Coordination of regional emergency response
CA Regional Water Quality Control Board - Central Valley Region	Regulation of waste discharge into surface waters Regulation of stormwater discharge
Federal Agencies	
U.S. Army Corps of Engineers	Regulation of discharge of dredged or fill materials into waters of U.S.
U.S. Department of Agriculture	
Natural Resources Conservation Service	Resource conservation and soils
U.S. Forest Service	Management of national forests
U.S. Department of Interior	
Fish and Wildlife Service	Protection of federally listed species
U.S. Bureau of Land Management	Management and permitting of activities on federal lands.
U.S. Environmental Protection Agency	Primacy for setting safe drinking water standards
	Protection of drinking water supplies
	Regulation of public water supply, treatment, and distribution systems

Table 6-2: Documents Reviewed for MRWSS Update 2005

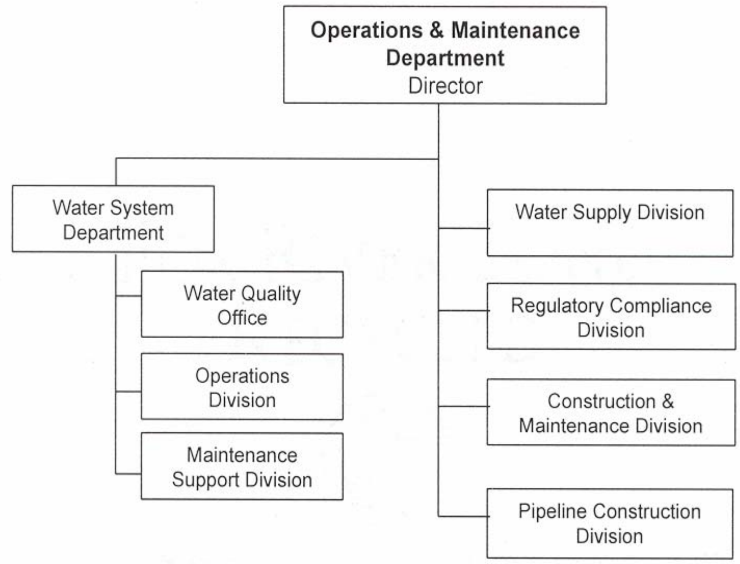
ID	Agency	Title	Date	Affected Management Practice
1	Amador County	Grading Ordinance	2003	Erosion Control
2	Amador County	Pesticide Use BMPs (by SPI)	2003	Pest Management
3	Amador County	General Plan, Housing Element Update	2005	Land Use
4	Amador Firesafe Council	Amador County Fire Hazard Reduction Plan	2004	Fire & fuel management
5	Calaveras County	General Plan, Housing Element Update	2005	Land Use
6	Calaveras County	Local Agency Ground Water Protection Program	2004	Waste Management
7	Caltrans	Stormwater Program Annual Report	2005	Stormwater Management
8	City of Jackson	Land Use Element	2004	Land Use
9	EBMUD	Various watershed management practices and BMPs	2005	Access Control, Pest Management, Recreation, Public Education, Erosion Control, Inspection, Surveillance, & Emergency Response, Grazing, Fire and Fuels Management
10	USDA Forest Service	Record of Decision (ROD) for Sierra Nevada Forest Plan Amendment	2004	Grazing, Fire and Fuels Management, Pest Management
11	USDA Forest Service	Water Quality Management For Forest System Lands in California Best Management Practices	2000	Logging, Grazing
12	Eldorado NFS	Final Environmental Impact Statement - Power Fire Restoration	2005	Fire & fuel management
13	PG&E	Ecological Committee Reports, Land Stewardship agreement	2005	Land Use
14	PG&E	Mokelumne River Project, FERC Project No. 137 Relicensing Agreement	2004	Land Use
15	Stanislaus NFS	Stanislaus Fire Plan	2004	Fire & fuel management
16	Stanislaus NFS	Forest Road Analysis	2001	Erosion Control
17	Stanislaus NFS	Forest Plan Direction: Motor Vehicle Travel Management	2004	Erosion Control, Access Control

For acronyms, see Appendix A.

Table 6-3: EBMUD Residual Dry Matter Requirements by Slope

Flat Slopes (0-5%)	600 Pounds/Acre
Medium Slopes (6-35%)	800 Pounds/Acre
Steep Slopes (>35%)	1,000 Pounds/Acre

FIGURE 6-1 - Water Operations & Maintenance Department and Natural Resources Department Organization Charts



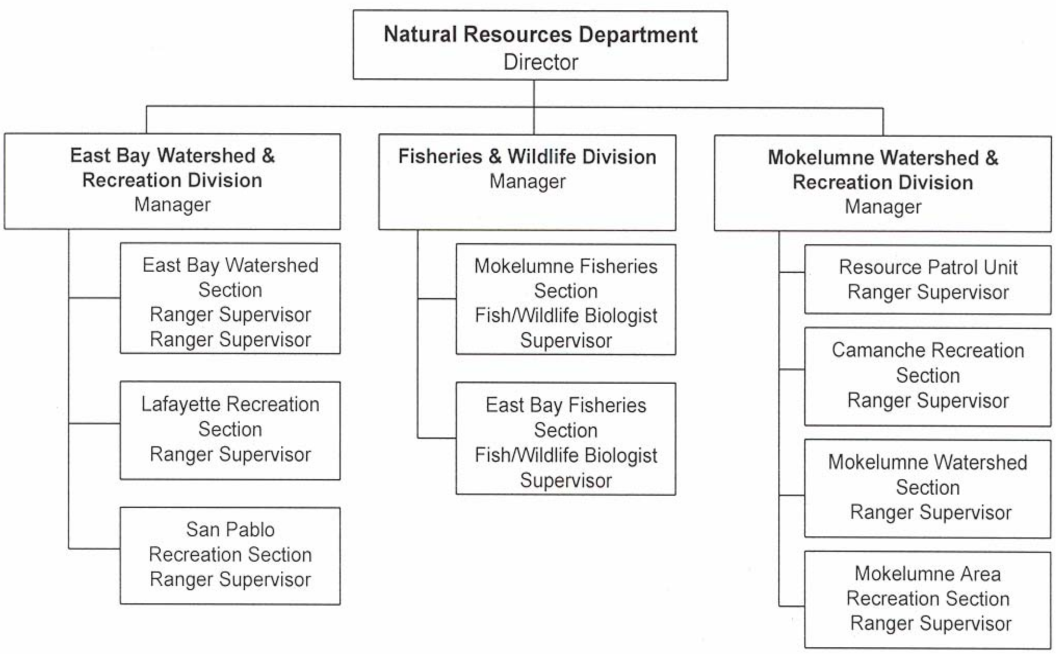


Figure 6-2: Brush removal on Rocky Ridge near Pardee Reservoir.

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Introduction

This section presents updates to potential corrective actions outlined in the Mokelumne River Watershed Sanitary Survey (MRWSS) 2000 Update. The potential corrective actions contained in this section were developed to strengthen source protection for the District's watersheds. Section 4: Water Quality showed that Pardee and Camanche Reservoirs store high quality Mokelumne River water, and a vigilant and active source protection program in the watershed is critical to maintaining this high quality.

The District's water treatment plants -- both small systems and large systems -- are effective at removing contaminants and meeting all federal and state drinking water regulations. However, the potential always exists for an unexpected mechanical breakdown or an act of nature to impair their ability to treat water, which could ultimately impact the quality of water supplied to the District's customers. Also, regulations for controlling treatment-related by-products continue increasing with improving technology and data for relating water quality parameters to health effects. Through source protection, concerns associated with process failures and by-product formation are reduced.

The potential corrective actions are grouped according to the following subjects: water quality, watershed control and management practices, inter-jurisdictional coordination, and public education. The majority of the forty-one listed potential corrective actions were developed for the MRWSS Update 2000. The potential corrective actions are based on the information contained in the 1995 MRWSS, the East Bay Watershed Sanitary Survey (EBWSS) Update 2000, the MRWSS Update 2000, and other documents from outside agencies. The District and other agencies with jurisdiction in the watershed will consider these potential corrective actions when additional land uses or changes to existing land uses within the watersheds are proposed. Annotations are included to indicate recent progress made for each recommended action.

The potential corrective actions are prioritized into low, medium, and high priority categories as shown in Table 7-1. These rankings are subjective; taking into account watershed characteristics (slope, soils, etc.), type and magnitude of potential contaminants, distance to water bodies, current and future drinking water regulations, and primary use of the reservoir (water supply or flood control).

Table 7-1: Summary of Potential Corrective Actions

#	CORRECTIVE ACTION	Priority	STATUS
	Water Quality Monitoring		
1	Monitoring Related to Specific Land Use and Activities	High	Ongoing
2	Reservoir Temperature Monitoring	High	Ongoing
3	Total organic carbon (TOC) Monitoring	High	Ongoing
4	MTBE Monitoring	High	Ongoing
5	Pesticide and Herbicide Monitoring	High	Ongoing
6	Land Disposal Monitoring	High	Ongoing
7	Organic Contaminants Follow-up Procedure	Medium	Ongoing
8	Penn Mine Monitoring	Medium	Ongoing
9	Septic Tank Monitoring	Medium	Ongoing
10	Urban Stormwater Monitoring	Low	Not started
11	Storm-Related Turbidity Monitoring	Low	Not started
12	Bathymetric Surveys	Low	Not started
13	Runoff from Historic Mines	Low	Ongoing
14	Raw and Finished Water Sampling	Low	Ongoing
	Watershed Control and Management Practices		
15	Forest Practices and Logging Management	High	Ongoing
16	Grazing Practices Management	High	Ongoing
17	Access Control Programs	High	Ongoing
18	In-Reservoir Recreation Management	High	Ongoing
19	Recreation - Body Contact Management	High	Ongoing
20	On-site Waste Management Programs	Medium	Ongoing
21	Seismic Evaluation	Medium	Ongoing
22	Off-Road Vehicle Usage Management	Medium	Ongoing
23	Road and Landing Construction and Maintenance	Medium	Ongoing
24	Fire Roads and Hiking Trails - Construction, Maintenance, and Use	Medium	Ongoing

Table 7-1: Summary of Potential Corrective Actions (continued)

#	CORRECTIVE ACTION	Priority	STATUS
	Watershed Control and Management Practices		
25	Identifying Hazardous Materials Storage and Transfer Facilities	Medium	Ongoing
26	Manage Runoff from Parking Lots and Roads	Medium	Under development
27	Reservoir Shoreline Protection	Medium	Ongoing
28	Protection of Riparian Corridors	Medium	Ongoing
29	Equestrian Use Policy	Low	Under development
30	Concentrated Animal Facility Best Management Practices (BMPs)	Low	Under development
	Inter-jurisdictional Coordination		
31	Water Quality Technical Coordination Forum	High	Ongoing
32	Emergency Response	High	Ongoing
33	Future Development	High	Ongoing
34	Stormwater Runoff	Medium	Under development
35	Erosion Control	Medium to High	Ongoing
36	Fire Suppression - Chemical Usage	Low	Ongoing
	Public Education		
37	Residential and Commercial Neighbors	Medium	Ongoing
38	Transportation Corridors	Medium	Ongoing
39	Recreational Trail Users	Medium	Ongoing
40	Community Outreach	Medium	Ongoing
41	Volunteer Organization	Low	Ongoing

Status of Potential Corrective Actions

Water Quality

Watershed water quality monitoring programs are critical to identifying contaminant sources and quantifying the concentrations of undesirable water quality parameters entering the reservoirs. Monitoring programs should be developed to assess long-term trends, and if possible, the loadings generated by runoff - particulates, microorganisms, heavy metals, disinfection by-product (DBP) precursors, nutrients, and synthetic organic compounds, including volatile organic chemical (VOCs), pesticides, and herbicides. Below are a number of potential monitoring programs for consideration by the District and other agencies where applicable.

(1) Monitoring Related to Specific Land Use and Activities. Monitoring programs for the following land uses and activities should be developed to determine the contribution of particular water quality contaminants of concern and to work with the adjacent landowners in reducing contributions of contaminants. The monitoring programs must be developed specific to each land use.

- Mokelumne River Project No. 137: Federal Energy Regulatory Commission (FERC) Project 137). Dissolved oxygen, pH, sediment, temperature, inorganic chemicals, nutrients, organic chemicals, total organic carbon, microorganisms (High Priority)
  Status 2005 - The District has an on-going extensive water quality-monitoring program for Pardee and Camanche Reservoirs. (pp. 4-25 to 4-55).

- Grazing - Microorganisms (High Priority)
  Status 2005 – Grazing practices within the largest landholder, National Forest Service (Eldorado and Stanislaus National Forests), were specified by their 2004 Sierra Nevada Forest Plan with 30 to 40 percent reduced grazing. District land current grazing allotments increased by 5 percent compared to the leases in effect in 2000 and are managed for fire prevention and restricted in the dry seasons to reduce erosion. (p. 5-13).

(2) Reservoir Temperature Monitoring. Continue collecting temperature data of Pardee and Camanche Reservoirs. In order to fully evaluate the effect of FERC Project 137 on the District's beneficial uses, detailed information on reservoir thermal stratification and increased water temperatures due to PG&E hydroelectric powerplant operations is necessary. Increased water temperatures could adversely affect the District's ability to manage the hypolimnion (coldwater pool) in Pardee and Camanche Reservoirs with resultant impacts on raw water quality and the anadromous fishery in the lower Mokelumne River. (High Priority)

Status 2005 - The District continues to collect weekly water quality profiles at several locations in Pardee and Camanche Reservoirs. In addition, the District is calibrating a 2-dimensional hydrodynamic model for the Pardee-Camanche system. The model will be able to simulate effects of various operations on temperature and dissolved oxygen, and will provide guidance to the reservoir operations planning. (pp. 5-10 and 5-33).

(3) TOC Monitoring. Continue monitoring TOC levels entering and residing within Pardee Reservoir. Expand monitoring to upstream tributaries, when warranted. TOC is a parameter that is targeted in the regulatory process as a surrogate for the presence of all other organics, particularly DBP precursors. (High Priority)

Status 2005 – The District continues to monitor TOC at Highway 49 to track the main tributary, designated locations within Pardee Reservoir and upstream tributaries, i.e., after the Power Fire in late 2004, when Salt Springs, Tiger Creek (TC), TC Canal and the TC Powerhouse were added. (pp. 4-22 and 4-36).

(4) MTBE Monitoring. Monitor Pardee and Camanche Reservoirs for MTBE to determine if control measures are warranted, particularly during the peak recreation season. (High/Medium Priority)

Status 2005 - The District continues its MTBE monitoring program at both Pardee and Camanche Reservoirs, although at much lower frequency (semi-annually) due to much lower MTBE levels since the District restricted gas motor types and the state reduced its MTBE in gasoline supplies. Graphs in pages 4-35 and 4-53 display both the reduced MTBE levels and adjusted sampling frequencies.

(5) Pesticide and Herbicide Monitoring. Request adequate monitoring of pesticide applications within the watershed as well as the buildup of residuals or the runoff of any residues into watershed water bodies, courses, and streams. Prompt action should be demanded of the enforcement agencies if any potentially adverse concentrations are detected at any point in the watershed. (High Priority)

Status 2005 – The District continues to monitor pesticide and herbicide levels entering into Pardee Reservoir to detect potential water quality concerns relating to these parameters. The California Department of Health Services (CDHS) has waived Synthetic Organic Carbons (SOCs), except atrazine, di(ethylhexyl)-phthalate, glyphosate and simazine. Those compounds, known to be used on the watershed, are required for monitoring every three years at Pardee Tower. (pp. 4-25 to 4-27).

(6) Land Disposal Monitoring. Increased inspection and surveillance of wastewater collection and land disposal systems by the Central Valley Regional Water Quality Control Board (RWQCB) should be requested. Although the Mokelumne Hill Sanitary District has ample pond capacity, land disposal area coliform levels in the Wilson Gulch sample location adjacent to Mokelumne Hill are elevated relative to the rest of the river. Further studies should be conducted to determine the source of the contamination. (High Priority)

Status 2005 – During the update period, the District performed an inventory and assessment of its wastewater collection and treatment systems. All wastewater facility locations and pertinent data for assessing their condition were input into a geographical information system (GIS) database, which was used to prioritize repairs and to develop a proactive maintenance schedule.

The District continues to collect bacteriological data at designated sampling locations throughout the lower regions of the Upper Mokelumne River and tributaries to further develop a dataset of bacteriological conditions. Elevated coliform levels at Wilson Gulch are primarily due to lack of dilution, since it is the only sampling station not on a main fork of the Mokelumne River. (pp. 4-18 and 4-23).

(7) Organic Contaminants. Establish a follow-up procedure for the organic contaminants detected in the raw and finished waters to determine possible source of contaminants or to determine false-positive results. (Medium Priority)

Status 2005 - Shortly after the 1995 MRWSS was published, a follow-up procedure was established for organic compounds detected in either raw or treated waters to notify CDHS and the District's sampling staff so that repeat sampling would be conducted. Two electronic backup systems are also in place to notify internally by e-mail at least daily in the event detectable levels for purposes of reporting (DLRs) are analyzed for organic compounds.

(8) Penn Mine Monitoring. Continue ongoing compliance monitoring of the Penn Mine Environmental Restoration Project. (Medium Priority)

Status 2005 - The District initiated this compliance-monitoring program in 1998. Construction activity for the Penn Mine Environmental Restoration Project was completed in December 1999. Three years of post-restoration monitoring of the Penn Mine facilities were conducted to ascertain the effectiveness of this environmental restoration project in returning the site to ‘pre-mining’ condition. Based on the results of this monitoring, the project was deemed successful and requirements for post-restoration monitoring were eliminated by the United States Environmental Protection Agency (USEPA). The District continues monthly monitoring of surface water runoff from the site for copper, zinc, pH and TDS. In addition, the maintenance inspections of the landfill and site stability are conducted on a regular basis. (p. 5-29).

(9) Septic Tank Monitoring. Improved monitoring, water quality assessment, and enforcement of septic tank regulations by the counties to help assure proper maintenance of existing systems should be implemented. Possible seepage from septic tanks near the river in the South Fork sub-watershed should be investigated. Pit toilets and vault toilets in campgrounds should be inspected, and old or malfunctioning ones replaced. For example, the Moore Creek Campground has aging vault toilets, which may allow some seepage into the ground water. (Medium Priority)

Status 2005 - The Calaveras County Local Agency Ground Water Protection Program was developed by Calaveras County Environmental Health in cooperation with the USEPA. Initiated in 2000, the program takes a comprehensive look at ground water availability, quality, and quantity. Data is collect in a GIS, and had been used to produce a Groundwater Protection Report (2004). This report identifies and maps threats to ground water quality, including septic systems, known failed septic systems, and leaking underground storage tanks.

The town of West Point has a number of residences with septic tanks and leach fields within 200 feet of the Mokelumne River which were not included in the grant-funded expansion for their sewer collection system due to a funding shortage needed for a pump lift station. The District is exploring the potential for a joint effort with Calaveras County Water District to submit a proposal for an USEPA grant to install a pump lift station for those residences. (pp. 5-5 to 5-7).

(10) Urban Stormwater Monitoring. Currently, a limited amount of monitoring data are available that documents the concentrations and loadings of constituents in urban stormwater. As development within the Pardee and Camanche watersheds increases, it will be important to assess the potential impacts of urban stormwater. (Low Priority)

Status 2005 - Increasing development along Mainstem of the Mokelumne River and Highway 89 have increased the potential impacts from urban stormwater. Construction activities in particular have the potential to contribute significant sediment loads, as was observed in January 2005 from the city of Jackson. (pp. 5-8 to 5-9).

(11) Storm-Related Turbidity Monitoring. The District should monitor rainfall at Pardee inflow to evaluate the possible trends between raw water turbidity and rainfall, and other contaminants including TOC, pesticides and herbicides, and other organic contaminants. (Low Priority)

Status 2005 - Following the October 2004 Power Fire, water quality samples were taken by the District, the U.S. Forest Service, and the United States Geological Survey (USGS). When feasible, storm water samples were collected from tributaries in the burned area, as well as from locations upstream of the burn to provide baseline concentrations. The District's sampling program spanned October 2004 to May 2005 to capture winter storm runoff as well as snowmelt from the burned area. Results have shown limited erosion impacts contributing to increased turbidity, with runoff during the 2005 spring season at 129 percent of average. (pp. 5-18 to 5-19).

(12) Bathymetric Surveys. Bathymetric studies provide useful information for reservoir and watershed management. Historical records exist and erosion and sedimentation rates have been estimated. Bathymetric surveys would aid in the assessment of evaluating contributions from tributary streams, and with management and restoration efforts. (Medium Priority)

Status 2005 - Water Supply Engineering has scheduled a survey for Camanche and Pardee Reservoirs in the next few years.

(13) Runoff from Historic Mines. Develop a watershed-wide map that locates historic mines, particularly those in proximity to tributaries and those that continue to be active. Coordinate map with the RWQCB to maintain a record of those mines that have historical drainage pollution problems or potentially developing a drainage problem. (Low Priority)

Status 2005 - the District has maintained a GIS dataset of active and inactive mines in the watershed (See Figure 5-9). Calaveras County Environmental Health also tracks current and historic mining operations as well on a GIS database as part of the Local Groundwater Protection Program. (p. 5-16).

(14) Raw and Finished Water Sampling. When sampling raw waters, collect and archive a corresponding sample of finished water prior to entering the distribution system. The archived samples can be analyzed at some later time if the raw water analyses measure any parameters in excess of the drinking water standards. (Low Priority)

Status 2005 – Water quality monitoring data are collected in accordance with Title 22 monitoring requirements, the Surface Water Treatment Rule (SWTR) Operations Plan 2005 and is archived by the District. Trend data are available in Chapter 4.

Watershed Control and Management Practices

Land uses and activities within the watershed have the potential for impacting reservoir water quality. Tailoring management and control efforts within the watershed is required to minimize risks associated with specific land uses and activities. The following potential corrective actions may be considered in implementing changes to the existing or providing input for future land uses and activities within the watersheds.

(15) Forest Practices and Logging (1995 MRWSS). Continue to insure adequate California Environmental Quality Act (CEQA) and Board of Forestry protection measures to protect forest resources and associated vegetation, wildlife, and aquatic resources. Educational programs should focus on the need to understand the nutrient release process that is accelerated by overly ambitious timber harvesting plans and operations. More data should be collected and research programs funded by those responsible for timber harvesting to document this phenomenon and its effects on watershed streams, lakes, and reservoirs and associated zoological and botanical species. (High Priority)

Status 2005 - During this update period, the Central Valley RWQCB has adopted new rules to now require a discharge waiver for all Timber Harvest Plans (THPs), and all Emergency harvest operations.

They are taking a more active role in proposing additional mitigation measures at the time of THP review and approval, and are usually attending pre-harvest inspections of THP areas. (pp. 5-19, 6-4 and 6-16).

(16) Grazing Practices. The District has developed a Rangeland Management Plan for their East Bay watersheds, which focuses on best management practices for grazing to prevent degradation of water quality. Wherever applicable, these Best Management Practices (BMPs) should be implemented by the District, private, and public entities that allow grazing on their properties. Specifically, the District should recommend the inclusion of provisions in grazing permits which insure that grazing livestock are kept out of riparian corridors to avoid damage to sensitive streamside riparian vegetation, streambanks and streambeds, as well as the water column itself. The District should encourage and promote the installation of fences as the only sure means of accomplishing this goal; however, the responsibility for this improvement lies solely with those private and public entities allowing the land use. As another example, cattle use should be minimized on lands with high erosion risk when the soil is saturated. (High Priority)

Status 2005 - The District has applied portions of its East Bay Rangeland Management Plan to a range management program in the Pardee and Camanche watersheds. Stocking levels are set based on rainfall and subsequent forage production each year, and lease agreements contain a residual dry matter (RDM) requirement to provide ground cover and minimize erosion. The Sierra Nevada Forest Plan Amendment (2004) directs management of National Forests lands, and contains guidelines for grazing management that restrict rangeland utilization in areas when it would be detrimental to riparian ecosystems or threatened species habitat. (pp. 5-13, 6-7 and 6-18).

(17) Access Control Programs. Continue watershed management programs that control human access and continue to fence riparian and sensitive watershed land particularly on grazing lands. Encourage the implementation of similar programs already in existence Coordinated Resource Management Areas (CRMAs) in Stanislaus National Forest and the formation of similar programs by other large landowners. Encourage Sierra Pacific Industries to continue its access control program and promote adoption of the same approach by the U.S. Forest Service. (High Priority)

Status 2005 - Following a Vulnerability Assessment conducted in 2003, the District has been implementing Capital Security Improvement Projects that will invest $20 million over the next ten years. The projects include improvements in fencing , gate access controls, and alarm systems throughout the water systems. In addition, Security Shift Supervisors have been added to patrol sites including source waters.

The Sierra Nevada Forest Plan Amendment (2004) contains new guidelines for restricting human and animal access to certain aquatic, riparian, and meadow ecosystems. Stanislaus National Forest produced a Forest Plan Direction for Motor Vehicle Management (2004) that establishes areas in Federal lands that are closed to off-highway vehicle (OHV) access. Sierra Pacific continues its efforts to prevent illegal OHV access to its logging road network.

The Stewardship council is funded by PG&E with $70 million over ten years to protect its watershed lands throughout California as part of its 2003 bankruptcy agreement. Of that balance, $20 million is expected to go into the planning process and with the remainder going into physical improvements, such as planting of trees to enhance fish and wildlife habitat and water quality. Presently, the amount of affected lands within the Upper Mokelumne Watershed (about 3 percent of PG&E's total) has not been determined. (pp. 5-14 and 6-5).

(18) In-Reservoir Recreation. Privately owned boats that can introduce various contaminants from different recreational water bodies is a serious issue for the District to consider. (High Priority)

Status 2005 – Boating policies continue to be enforced at the District's recreation facilities to prevent the introduction of exotic species to Pardee and Camanche Reservoirs. Though all boats cannot be inspected for invasive aquatic organisms, monthly Zebra mussel sampling in 2005 for the mollusk by the Department of Water Resources resulted in no detections in Pardee. (p. 5-15).

(19) Recreation – Body Contact. The District currently does not allow body contact recreational activities in Pardee Reservoir; and allows restricted body contact recreation in Camanche Reservoir. To reduce the risk of pathogenic contamination, the prohibition of body-contact activities in Pardee Reservoir and promotion of public awareness concerning the protection of source water quality must be continued. (High Priority)

Status 2005 – The District continues its policy to prohibit body-contact recreation at Pardee Recreation Area and limit body-contact recreation at Camanche South Shore Recreation Areas away from the water intake. In 2003 the District officially sanctioned the use of a portion of the property in the Middle Bar Bridge area, above Pardee Reservoir, for the use of river rafters and kayakers to exit the river. (pp. 5-14 and 5-23).

(20) On-site Waste Management Programs. Develop on-site waste management programs for septic systems and leach fields or on-site waste treatment systems (OWTS) within the watershed basins. Encourage the public works and the land use planning departments with jurisdictional controls to adopt, implement, and enforce these management strategies. The program could include the following components: identify and locate all OWTS; regularly inspect each system for integrity and adequacy; review pumping records; require upgrades to bring existing OWTS into compliance with current codes; establish minimum setbacks from tributary streams; establish on-going septic tank pumping requirements; develop funding alternatives for low-income property owners; evaluate retrofit of existing OWTS with leak alarms; conduct on-going monitoring programs in surface waters (and groundwater, if possible) to identify failed or inadequate OWTS; and establish enforcement schedules and penalties. (Medium Priority)

Status 2005 - Signed into law in 2000, AB885 authorized regulation of OWTS through the State Water Resources Control Board (SWRCB), which is releasing a draft EIR in early 2006 for implementation in 2007. Proposed regulations will require: an operation permit for new systems dispersing under-pressure, at-grade or above-ground, permits for new or replacement OWTSs, effluent concentration and dispersal solids size limitations, designer, operator and evaluator professional certification, inspection of septic tank by qualified provider upon property ownership change, groundwater monitoring in vicinity of the OWTS discharge and installation of supplemental treatment systems to meet effluent limitations. Though intended for state-wide application, implementation will be contingent upon the resources available for each county. The upgrade requirement for installation of supplemental treatment systems to meet effluent limitations will most likely apply to OWTS within 600 feet of an impaired waterbody on the 303(d) list. (pp. 5-5 and 6-21)

(21) Seismic Evaluation. Perform a seismic evaluation for facilities within the watershed, including pipelines and conveyances, dams, intake structures, and other facilities critical for maintaining water service during emergencies to minimize fire damage and resulting water quality impacts. (Medium Priority)

Status 2005 - Pardee Tower has been evaluated on a preliminary basis in 1987 and 1998, with a final analysis forthcoming.

(22) Off-Road Vehicle Usage. Encourage Sierra-Pacific and the National Forests to continue their programs to curtail and control the damage caused by indiscriminate and irresponsible four-wheel drive vehicle operators. Holders of other lands subject to the same type of damage should be encouraged to take similar steps. (Medium Priority)

Status 2005 - Off-Highway Vehicles (OHVs) have been recognized by the Chief of the Forest Service as one of the key threats facing the nation's forests. In June 2004, Stanislaus National Forest produced a Forest Plan for Motor Vehicle Management that increases restrictions or bans OHV access. The Eldorado National Forest implemented a ban on all OHV use off designated trails in August 2005, closing approximately 700 miles of non-system routes while an EIS is in progress. (p. 6-12)

(23) Road and Landing Construction and Maintenance. Develop site-specific management guidelines addressing soil erosion and sediment delivery potential from roads near streams, roads crossing streams, roads crossing unstable slopes, and roads crossing erodible soils. Prevent severe surface erosion events caused by road building that directly impacts any stream. Maintenance of existing roads and landings after timber operations will be improved. (Medium to High Priority)

Status 2005 - In 2001, the Forest Service issued the final National Forest System Road Management Rule which is designed to shift the emphasis from construction of new roads to managing existing roads and decommissioning unneeded roads in the interest of ecosystem health. The Stanislaus Forest Roads Analysis (2004) meets the requirement for a roads analysis, and contains site-specific guidelines for assessing and managing existing Forest Service roads to minimize erosion. Sierra Pacific is increasing the amount of road crossing repairs and replacements, and the amount of road rocking and other techniques (such as the placement of filtering strawbales, straw wattles, and mulching techniques) when working in proximity to streams. (p. 6-14)

(24) Fire Roads and Hiking Trails. Review and identify BMPs and standards for fire road and hiking trail construction, maintenance, and use. Prohibit trail uses that would increase erosion above current levels. The District is developing a comprehensive plan for fire roads within its jurisdiction. Protection of water quality and supply impacts of this plan should be considered as a high priority issue. (Medium to High Priority)

Status 2005 – Roads mowed during the update period are shown in Figure 5-11. Recreation influenced by the 2004 Power fire included: nine campsites, many hiking trails, and over 200 miles of OHV routes. The fire and the restoration projects have opened new clearings, skid trails, and haul roads, which historically have been subject to illegal OHV activity and can have lasting water quality impacts. (p. 6-27)

(25) Hazardous Materials Storage and Transfer Facilities. Conduct site visits of hazardous materials storage and transfer facilities within the watersheds which may be owned by the District, public works departments, Sierra Pacific, PG&E, golf courses, industries, etc. Collaborate with other responsible agencies in the training of personnel and inspectors on how to identify risks to drinking water and choosing effective protective measures. (Medium to High Priority)

Status 2005 - The District performs annual updates its Environmental Emergency Response and Release Prevention Plans for all facilities where hazardous materials are handled or stored. (p. 5-7)

(26) Runoff from Parking Lots and Roads. Review stormwater collection systems from parking lots and roads serving watershed facilities. Consider pretreatment options or rerouting discharge away from reservoirs. (Medium to High Priority)

Status 2005 - In June 2001, Pardee Center obtained a National Pollutant Discharge Elimination System (NPDES) Industrial Storm Water Permit from the RWQCB for operations associated with the Pardee lime facility. The District developed and implemented a Storm Water Pollution Prevention Plan and a Monitoring and Reporting Program in compliance with the permit conditions. The District is requesting removal from the storm water program in 2006. (pp. 5-4 and 5-8).

(27) Reservoir Shoreline. Assess measures to restore and protect eroded reservoir shorelines. Public access for fishing could be restricted to piers. In addition, establishing a narrow margin of plants or rocks would protect the shoreline from erosive wave action particularly in reservoirs that allow boating. (Medium to High Priority)

Status 2005 – Boating policies are enforced at the recreation areas of Pardee and Camanche Reservoirs to restrict speeds for public safety and environmental protection.

(28) Protection of Riparian Corridors. Promote protection of riparian corridors through the establishment of setbacks. Review various approaches and encourage the implementation of effective BMPs for protecting riparian zones. (Medium to High Priority)

Status 2005 – EBMUD guidelines for all District-owned lands focus on implementing and maintaining best management practices to protect natural resources that include the riparian zones under District jurisdiction. Development of the District's Mokelumne Watershed Master Plan in the next five years will address this issue.

(29) Equestrian Use. Develop integrated policies with regard to equestrian use of watershed lands. Conduct census on number of horses stabled or pastured within watersheds, and annual use of equestrian facilities. Because of the potential for transmission of pathogens, horses are prohibited from access to reservoirs. This affords the maximum advantage of the filtering capacity of the soil. (Low Priority).

Status 2005 – Development of the District's Mokelumne Watershed Master Plan in the next five years will address this issue.

(30) Concentrated Animal Facilities. BMPs should be developed for concentrated animal facilities such as stables, corrals, paddocks, riding arenas, and equestrian camping facilities. Recommendations should be developed, tailored to each site. (Low to Medium Priority).

Status 2005 – During the update period no facilities were found.

Interjurisdictional Coordination

The District has several outreach activities to establish proactive lines of communication with neighboring agencies and those with overlapping jurisdictions. This is important in responding rapidly and efficiently to emergencies, as well as instilling the value of water quality protection within the watersheds.

(31) Water Quality Technical Coordination Forum (now Upper Mokelumne River Watershed Authority). A technical coordination forum, consisting of key stakeholders in the watershed should be formed that share the common interest of resolving impending or potential watershed water quality problems. It would be mutually beneficial for participating members in addressing watershed issues that require multiple agency commitment to enact. (High Priority)

Status 2005 – The above forum has morphed into the Upper Mokelumne River Watershed Authority (UMRWA). UMRWA is a coalition of stakeholders (Alpine County, Alpine County Water Agency, Amador County, Amador Water Agency, Calaveras County, Calaveras County Water District, Calaveras County Public Utility District, EBMUD, Jackson Valley Irrigation District). The UMRWA is entrusted, with stakeholder and Proposition 13 and 50 grant funding, to develop the Upper Mokelumne River Watershed Assessment. The project will develop watershed assessment methodologies, compile existing data on watershed conditions, perform water quality monitoring, develop GIS and model meteorological, land-use and water management applications. Scheduled for completion in 2008, impacts on water quantity, power revenue and water quality will be evaluated with varied land-use alternatives within the watershed. (p. 6-12).

(32) Emergency Response. Emergency response procedures for various scenarios that can affect raw water quality must be identified and coordinated with local, state, and federal agencies. On-going coordination with agencies or entities such as Alpine, Amador, and Calaveras counties, Amador County Water Agency, Calaveras County Public Utility District, Calaveras County Water District, Jackson Valley Irrigation District, Sierra Pacific, PG&E, BLM, and Eldorado and Stanislaus National Forests in advance of any emergencies to clearly define and prioritize the most critical actions and responses is essential and should be maintained. (High Priority)

To ensure that the District staff will have adequate time to take appropriate actions during emergencies, the notification procedures from other agencies such as Caltrans, Office of Emergency Services, California Highway Patrol, County Health Departments, County Agricultural Commissions, California Department of Fish and Game, and RWQCB, need to be reviewed. (High Priority)

Status 2005 - The Mokelumne Watershed and Recreation Division has Resource Patrol Units (RPU) whose primary responsibility is to protect the public and District property in the Mokelumne area. Assisting rangers in patrol functions are local sheriffs brought in under contract. Two full-time deputies from both Amador and Calaveras counties are assigned year-round to District lands. The RPU also takes the lead for the District response to wildland fires on or near our property, in addition to other emergencies such as hazmat spills, vehicle accidents, boating accidents, fights, and medical emergencies. Drownings, physical assaults, bee stings, boating and vehicle accidents are just some of the medical emergencies attended by RPU staff.

Security Shift Supervisors are trained first responders for any security or emergency response incident and have access to the full range of resources available to the District. If there is a report or threat of a terrorist or other security concern or any natural or man-caused emergency, while Mokelumne staff coordinates these matters with the local Sheriffs offices, fire departments and other resources, the District Security and Emergency Preparedness Office at the Security Operations Control Center (SOCC) will also be called, at 510-287-0999. The SOCC will notify the on duty Shift Supervisor and the Manager of Security and Emergency Preparedness, who will coordinate with the involved superintendents and managers in the Mokelumne area, and scale the appropriate response and Emergency Operations Center support in keeping with the Standardized Emergency Operations System (SEMS), National Incident Management System (NIMS) and the National Response Plan (NRP). (p. 6-24).

(33) Future Development. Foster cooperation from landowners, developers and managers by further opening good lines of communication, and by providing educational information on the impacts certain development practices may have on the watershed. As new developments are being planned the District should assume a proactive role in commenting on the proposed plans and emphasizing the potential impacts on water quality. Specifically, sanitation facilities need to be reviewed and parcels which are key to water quality protection should be identified. (High Priority)

Status 2005 - The UMRWA is continuing in its evaluation of watershed impacts from its Upper Mokelumne River Watershed Assessment, scheduled for completion in 2008. The consultant is developing a model for determining threats to support for beneficial uses. One of the beneficial uses, public drinking water supplies, will be evaluated along with recreation, riparian and aquatic habitats. Potential threats of significance include: timber harvesting, hydropower production, wildfires and land development.

NPDES C.3 requirements started taking effect in 2004, with planning implications for each new development or significant redevelopment. But the timing of feedback from review for each permit is crucial since conditions of approval can only be changed in the planning phase, with the CEQA documentation, if required. Only during the planning department or planning commission approval stage can the project have attached Conditions of Approval with BMPs effectively implemented. After that initial approval phase, more Conditions of Approval are not possible. (pp. 6-10 and 6-12).

(34) Stormwater Runoff. Review stormwater collection systems on county roads adjacent to the reservoirs. Rank reaches of roads by risk and consequence of potential impacts. For highest priority roads, evaluate the alternatives to minimize contaminants identified in road runoff from entering the water supply, including treatment alternatives in the reservoir or at the water treatment plants. Consider the development of spill containment basins to sequester any hazardous substances prior to entering reservoirs. (Medium Priority)

Status 2005 - Power Fire effects are still preliminary since less than one year of monitoring was available since the October 2005 report was available. While the water quality impact of runoff after the fire appeared insignificant, the runoff for the period after the fire was relatively light.

Paved and unpaved roads are in the process of being inventoried for potential spill impacts into the Mokelumne River. Collaboration will then take place with Alpine, Amador and Calaveras counties to review response plans to spills at sites with the most risk to the District. (pp. 5-18 and 6-27).

(35) Erosion Control. Continue efforts to require landowners and those with legal control authority to restrict or control road building, which initiates or accelerates soil erosion. Emphasis should be placed on private and National Forest areas, which do not have successful erosion control plans in effect. Known problem areas should continue to be the focus of land remediation efforts supported by adequate funding from private and public agencies responsible for the impacts. All of the entities with activity control authority should be encouraged to continue meeting and working together to share the benefits of resource and problem area inventories, and to share or exchange ideas on control strategies. (Medium to High Priority)

Status 2005 - Power Fire effects are a concern with severely steep portions of the burned watershed still at risk of accelerated erosion. The potential exists, especially with warm tropical storms on a light snowpack, for highly turbid and silted runoff to occur in the near future. With the Upper Mokelumne River Watershed Assessment modeling and data compilation efforts, more information will result on impacts of housing development, timber harvesting and wildfires. (pp. 6-12 and 6-27).

(36) Fire Suppression Chemical Usage. Review chemicals used during fire suppression and assess potential impacts on water quality. (Low Priority)

Status 2005 - Power Fire chemicals used in October 2004 were standard fire retardants from aerial applications. Their impacts were not evaluated specifically, though they appear to be negligible. (p. 5-18).

Public Education

Materials for public education on the importance of water supplies and activities that affect water quality and potential protection measures should be developed and distributed. These public education materials can either be targeted to District owned and managed facilities and/or to the entire watershed lands. For lands outside District jurisdiction, coordination with other agencies is essential. A number of public education components are recommended each targeting a specific audience.

(37) Residential and Commercial Neighbors. Develop an aggressive public information campaign for residents and neighbors on the unique advantages and responsibilities of living on watershed lands. Provide materials regarding the water quality and supply impacts of the following activities: lawn and gardening practices (e.g. erosion control, fertilizer and pesticide application, etc.); use of hazardous materials; local facilities for hazardous materials disposal (e.g.. neighborhood drop-off points, semi-annual neighborhood collection programs, etc.); construction and renovations; appropriate disposal of pet wastes; and vehicle maintenance and leak prevention. An emergency telephone number should be established for reporting spills, illegal dumping, and indiscriminate usage of pesticides and fertilizers. (Medium to High Priority)

Status 2005 – Highest priority would include: septic tank leach field systems along the Mokelumne River, erosion from grading of private roads and animal containment to avoid bank erosion and microbial contamination of streams. Communications during the UMRWA meetings provide a forum for discussing these causes and their impact on water quality.

Both Amador and Calaveras Counties participated in an “Ag” Clean Up Day in March 2003 to dispose of excess and disallowed chemicals with an independent agency hired to collect and dispose of the chemicals by incineration. Alpine County has no specific program for public education. They do produce a newsletter, the "Alpiner" which covers a variety of topics including recycling. Amador has on-going public education for agricultural users. Calaveras County has not implemented such a program, though their Health Department has materials for distribution. (pp. 5-6, 6-12 and 6-26).

(38) Transportation Corridors. Launching a public awareness and education campaign using signs along transportation corridors in watersheds with emergency contact numbers for reporting spills were modified in light of post-September 11th security concerns. (Medium Priority)

Status 2005 – Highest priority would now include: an inventory of paved and unpaved roads with high potential spill impacts into the Mokelumne River and coordinated communications for emergency responses for spill, illegal dumping, etc. As in Tasks 32 Emergency Response and 34 Stormwater Control above, collaboration with Alpine, Amador and Calaveras counties to review response plans to spills at sites with most risk to the District will be addressed in the near future. (pp. 5-11, 6-9 and 6-24).

(39) Recreational Trail Users. Trail users of District, Sierra-Pacific, Eldorado and Stanislaus National Forests, and PG&E watershed lands must be educated through pamphlets and signage on the importance of protecting their drinking water supplies, activities that may threaten water quality, and measures to minimize risk, e.g. appropriate methods of human sanitation in areas not equipped with toilets, minimizing erosion by staying on trails, cleaning up after dogs, etc. (Medium Priority)

Status 2005– Source water protection and water quality awareness pamphlets have been developed by the District and are available at the District's recreation facilities to the public. Inspections of recreational areas were in excellent condition. Off-highway vehicle recreational usage presents more of a concern on non-District forest roads. (pp. 5-15, 6-9 and 6-12).

(40) Community Outreach. The District, in concert with other agencies, may want to consider developing community outreach efforts through public school education programs. A number of water quality concerns should be embraced by neighborhood coalitions for action: erosion, deteriorating metals, and inadequate septic systems. Enlisting residents to participate in the Friends of the Watershed may also raise awareness and stimulate action on these problems. (Medium Priority)

Status 2005 - Highest priority would include: septic tank leach field systems along the Mokelumne River, erosion from grading of private roads, kayaking, river-rafting impacts and animal containment to avoid bank erosion and microbial contamination of streams. Communications during the UMRWA meetings provided a forum for discussing these causes and their impact on water quality. Community workshops in Jackson and Mokelumne Hill in 2004 and 2005 were professionally-led on the UMRWA project goals, tasks and schedule to ensure sufficient representation of watershed interests for viable watershed assessment and management plan. (pp. 5-14, 6-12 and 6-24).

(41) Volunteer Organizations. The District in concert with other agencies may want to initiate a Friends of the Watershed organization. This would be a volunteer organization consisting of residents, neighbors, and other friends. The purpose would be to nurture local commitment to protection of water quality and supply and foster an appreciation of the watersheds' biological resources. A program such as this may also result in increasing pressure to share decision-making. (Low Priority)

Status 2005 - Trail maintenance projects to avoid bank erosion were hosted biweekly by the District, including volunteers planting, cleaning, bank construction and riparian restoration along the Mokelumne Coast to Crest Trail. Also, cooperation was conducted with organizations and firms promoting kayaking/river-rafting activities to prevent microbial contamination of streams. Communications during the UMRWA public outreach and stakeholder meetings would provide a forum for discussing development, wildfires and timber harvesting impacts on water quality. (pp. 6-9 and 6-25).

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APPENDIX A

Reference sources for Sections 5 and 6

Reference Sources for Sections 5

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Section 6

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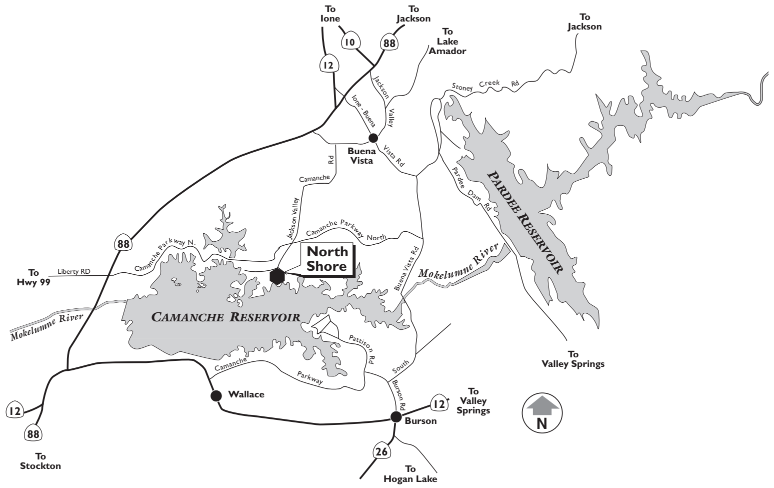
EBMUD

CAMANCHE NORTH SHORE 2000 WATER QUALITY ANNUAL REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

The Park Advisory Board meets in March, July and November at Pardee Center to discuss matters relating to water quality. For exact dates and times, please call (209) 772-8203. Public participation is encouraged.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Three deep wells are the water sources for Camanche North Shore Recreation Area. Water is treated at the Camanche North Shore Water Treatment Plant. Treatment includes: chlorination, potassium permanganate addition for iron and manganese removal, and filtration. A new 150,000 gallon water storage tank was placed in service this year. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Camanche North Shore Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2000.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (EPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

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Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in our system in 2000.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 36 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS). Fluoride samples were taken from the source waters.

Lead and copper were last monitored in 1998 at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. The most recent radioactve sampling of source water was performed in 1998. Results were within standards.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. SOCs are monitored to determine sources of industrial and agricultural contamination. Atrazine and Simazine are monitored once every six years and were not detected during the last monitoring in 2000. The DHS waived monitoring requirements for the remaining SOCs.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. No detectable levels of VOCs (including MTBE) were found in 2000. The DHS requires monitoring of VOCs once every three years.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is required once every 36 months except Thiobencarb which is waived by the DHS. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated.

Camanche North Shore 2000 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2000 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2000. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants is not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Inorganic Contaminants						
Fluoride (mg/L)	2	1	0.13	0.13		Erosion of natural deposits
Radioactive Contaminants						
Alpha activity (pCi/L)	15	(0)	2.4	ND – 8	1998	Erosion of natural deposits
Radium 226 & 228 (pCi/L)	5	(0)	1.5	1–2	1998	Erosion of natural deposits
Lead						
Lead (µg/L)	AL = 15	2	90^{th} percentile = 4.5	No site above AL out of 5 sites sampled.	1998	Corrosion of household plumbing
Organic Contaminants						
Trihalomethanes (µg/L)	100	NS	29	24 – 38		By-product of drinking water chlorination

Secondary Parameters	MCL	Average	Range	Sample Date	Violation	Typical Sources
Chloride (mg/L)	250	33	33			Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive				Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Odor–Threshold (TON)	3	1.3	1.3			Naturally occurring organic materials
Specific Conductance (µmho/cm)	1600	430	430			Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	11	11			Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (mg/L)	1000	260	260			Runoff/leaching from natural deposits
Turbidity (NTU)	5 NTU	NS	0.2	N/A		Soil erosion

Unregulated Contaminants	MCLG	Average	Range	Typical Sources
Bromodichloromethane (µg/L)	0	7.9	4.7 – 12	By-product of drinking water chlorination
Bromoform (µg/L)	NS	3.9	1.2 – 6.8	By-product of drinking water chlorination
Chloroform (µg/L)	NS	7.7	1.8 – 16	By-product of drinking water chlorination
Dibromochloromethane (µg/L)	0	10.0	7.7 – 12	By-product of drinking water chlorination

Other Parameters*	Level Found	Other Parameters*	Level Found
Alkalinity, bicarbonate (mg/L)	139	Sodium (mg/L)	28.4
Alkalinity, carbonate (mg/L)	1	Hardness (mg/L)	120
Calcium (mg/L)	38.2	Boron (mg/L)	0.1
Magnesium (mg/L)	9.3	Potassium (mg/L)	10.3

*One sample collected during 1999 from treated water.

Key

AL = Regulatory Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
N/A = Not Applicable
ND = Not Detected.
NS = No Standards
NTU = Nephelometric Turbidity Units
pCi/L = picoCuries per liter (a measure of radioactivity)
PHG = Public Health Goal
TON = Threshold Odor Number
µg/L = micrograms per liter, or parts per billion (ppb)
µmhos/cm = micro mhos per centimeter (measure of conductivity)
90^{th} Percentile = 90% of samples had lower values than indicated

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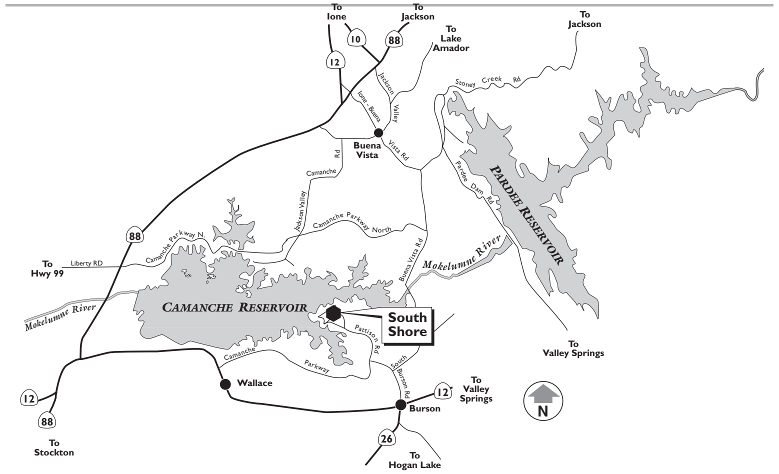
Camanche South Shore 2000 Water Quality Annual Report



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Camanche Reservoir is the water source for Camanche South Shore Recreation Area. The Recreation Area is served by Camanche South Shore Water Treatment Plant. Treatment includes: chlorination, coagulation, and filtration. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Camanche South Shore Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2000.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Definitions

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Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people

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are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found one coliform bacteria sample with detectable levels in our system in 2000.

Inorganic Contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic waste-water discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 12 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS). An aluminum sample was taken from treated water.

Lead and copper were last monitored in 1998 at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. The most recent radiological sampling of source water was performed in 1997. Results were within standards.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. SOCs are monitored to determine sources of industrial and agricultural contamination. The DHS waived monitoring requirements for SOCs.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The latest monitoring occurred in 1999 and no detectable levels of VOCs (including MTBE) were found. The DHS requires monitoring of VOCs once every three years.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is required once every 12 months except Thiobencarb which is waived by the DHS. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated. General minerals and chemicals are monitored once a year as required by the DHS.

Camanche South Shore 2000 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2000 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1, through December 31, 2000. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

PRIMARY CONTAMINANTS	MCL	PHG (MCLG)	LEVEL FOUND	RANGE	SAMPLE DATE	TYPICAL SOURCES
Total Coliforms	One coliform positive sample	(0)	One positive sample	ND – One		Naturally present in environment
Turbidity (NTU)	TT = 5 NTU	NS	0.12	N/A		Soil erosion
	TT = 95 percent of samples <0.5 NTU	NS	100%	N/A		
*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.						
RADIOACTIVE CONTAMINANTS						
Alpha activity (pCi/L)	15	(0)	1	ND – 3	1997	Erosion of natural deposits
COPPER AND LEAD						
Copper (mg/L)	AL = 1.3	0.17	90th percentile = 0.23	No sites above the AL out of 5 sites sampled	1998	Corrosion of household plumbing
Lead (µg/L)	AL = 15	2	90th percentile = 4	No sites above the AL out of 5 sites sampled	1998	Corrosion of household plumbing
ORGANIC CONTAMINANTS						
Trihalomethanes (µg/L)	100	NS	61	41 – 80		By-product of drinking water chlorination

SECONDARY PARAMETERS	MCL	AVERAGE	RANGE	SAMPLE DATE	VIOLATION	TYPICAL SOURCES
Chloride (mg/L)	250	3.2	3.2			Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive				Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Odor–Threshold (TON)	3	2.3	2.3			Naturally-occurring organic materials
Specific Conductance (µmho/cm)	1600	52	52			Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	1.9	1.9			Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (mg/L)	1000	34	34			Runoff/leaching from natural deposits
Turbidity (NTU)	5 NTU		0.05 – 0.12			Soil erosion

UNREGULATED CONTAMINANTS	MCLG	AVERAGE	RANGE	TYPICAL SOURCES
Bromodichloromethane (µg/L)	0	2.7	2.0 – 3.2	By-product of drinking water chlorination
Chloroform (µg/L)	0	58	38 – 77	By-product of drinking water chlorination
Dibromodichloromethane (µg/L)	0	ND	ND – 0.5	By-product of drinking water chlorination

OTHER PARAMETERS*	LEVEL FOUND	OTHER PARAMETERS*	LEVEL FOUND
Alkalinity, bicarbonate (mg/L)	18	Magnesium (mg/L)	1.4
Boron	10	Potassium (mg/L)	2.2
Calcium (mg/L)	4.8	Sodium (mg/L)	7.5
Hardness (mg/L)	17		

*One sample collected during 2000 from treated water.

KEY

AL = Regulatory Action Level	**ND** = Not Detected.	**TON** = Threshold Odor Number
MCL = Maximum Contaminant Level	**NS** = No Standards	**TT** = Treatment Technique
MCLG = Maximum Contaminant Level Goal	**NTU** = Nephelometric Turbidity Units	**µmhos/cm** = micro mhos per centimeter, measure of conductivity
mg/L = milligrams per liter, or parts per million (ppm)	**pCi/L** = picoCuries per liter (a measure of radioactivity)	**µg/L** = micrograms per liter, or parts per billion (ppb)
N/A = Not Applicable	**PHG =** Public Health Goal	**90th Percentile** = 90% of samples had lower values than indicated

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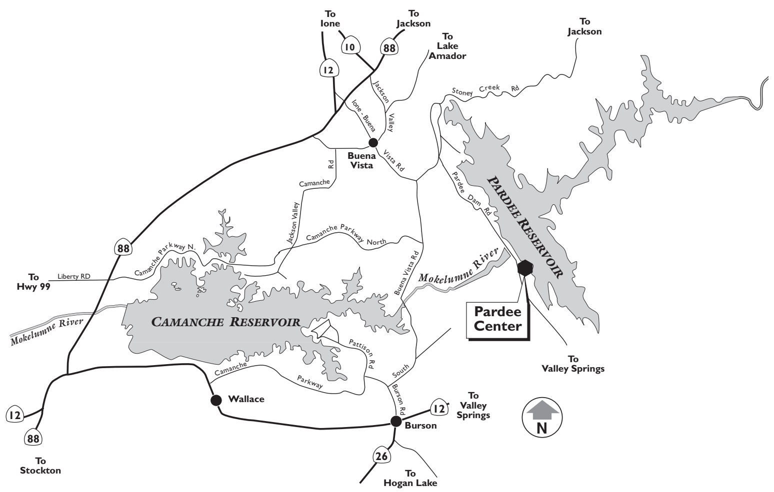
PARDEE CENTER
2000 WATER QUALITY ANNUAL REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Pardee Reservoir is the water source for Pardee Center. Pardee Center has a dual water distribution system. The non-potable system serves the fire hydrants, irrigation system, chemical buildings, and various other uses throughout Pardee Center. Pardee Center is served by a state-of-the-art nanofiltration membrane water treatment facility. Nanofiltration can remove particles as small as 0.001 microns. Water treatment also includes the addition of soda ash for corrosion control. A new floating pumps platform was installed this year adjacent to Pardee Reservoir Tower to draw water directly from the reservoir. The distribution system is served by a 13,900 gallon water storage tank. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Pardee Center water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2000.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public or Maximum Contaminant Level Goals as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Current test

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methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in our system in 2000.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 12 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS).

Lead and copper were last monitored in 1998 at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. Monitoring of radiological contaminants was waived by the DHS.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides, which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. The DHS has waived monitoring of SOCs for Pardee Center.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The latest monitoring in 2000 showed no detection of VOCs including MTBE.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of parameters with secondary MCLs was waived by the DHS.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated. General minerals and chemicals are monitored once a year as required by the DHS.

Pardee Center 2000 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2000 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1, through December 31, 2000. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Turbidity (NTU)	TT = 5 NTU	NS	0.1	N/A		Soil erosion
	TT = percentage of samples <0.5 NTU	NS	100%	N/A		
*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.						
Radiological Contaminants						
Alpha activity (pCi/L)	15	(0)	<1	<1 – 2	1999	Erosion of natural deposits
Beta activity (pCi/L)	50	(0)	6	6	1999	Decay of natural and man-made deposits
Inorganic Contaminants						
Aluminum (mg/L)	1.0	1.0	0.10	ND – 0.18		Erosion of natural deposits
Organic Contaminants						
Trihalomethanes (µg/L)	100	NS	1.5	1.1 – 1.8		By-product of drinking water chlorination
Copper and Lead						
Copper (mg/L)	AL = 1.3	0.17	90th percentile = 0.23	No sites above the AL out of 5 sites sampled	1998	Corrosion of household plumbing
Lead (µg/L)	AL = 15	2.0	90th percentile = 1.6	No sites above the AL out of 5 sites sampled	1998	Corrosion of household plumbing

Secondary Parameters	MCL	Average	Range	Typical Sources
Aluminum (µg/L)	200	100	ND – 180	Erosion of natural deposits
Chloride (mg/L)	250	1.8	1.8	Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive		Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Odor–Threshold (TON)	3	2	2	Naturally occurring organic materials
Specific Conductance (µmho/cm)	1600	35	31 – 38	Substances that form ions when in water; seawater influence
Total Dissolved Solids (mg/L)	1000	23	23	Runoff/leaching from natural deposits
Turbidity (NTU)	5	0.23	0.23	Soil erosion

Unregulated Contaminants	MCLG	Average	Range	Typical Sources
Bromodichloromethane (µg/L)	0	ND	ND – 0.5	By-product of drinking water chlorination
Chloroform (µg/L)	NS	0.9	0.7 – 1.4	By-product of drinking water chlorination

Other Parameters	Average	Range	Other Parameters	Average	Range
Alkalinity, bicarbonate (mg/L)	18		Magnesium (mg/L)	0.38	0.38 – 0.39
Boron	7.9	7.5 – 8.2	Potassium (mg/L)	0.33	0.32 – 0.34
Calcium (mg/L)	1.2	1.2 – 1.3	Sodium (mg/L)	5.0	4.3 – 5.7
Hardness (mg/L)	6.4	5.2 – 7.5			

Key

AL = Regulatory Action Level	**ND** = Not Detected.	**TON** = Threshold Odor Number
MCL = Maximum Contaminant Level	**NS** = No Standards	**TT** = Treatment Technique
MCLG = Maximum Contaminant Level Goal	**NTU** = Nephelometric Turbidity Units	**µmhos/cm** = micro mhos per centimeter, measure of conductivity
mg/L = milligrams per liter, or parts per million (ppm)	**pCi/L** = picoCuries per liter (a measure of radioactivity)	**µg/L** = micrograms per liter, or parts per billion (ppb)
N/A = Not Applicable	**PHG =** Public Health Goal	**90th Percentile** = 90% of samples had lower values than indicated

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PARDEE RECREATION AREA
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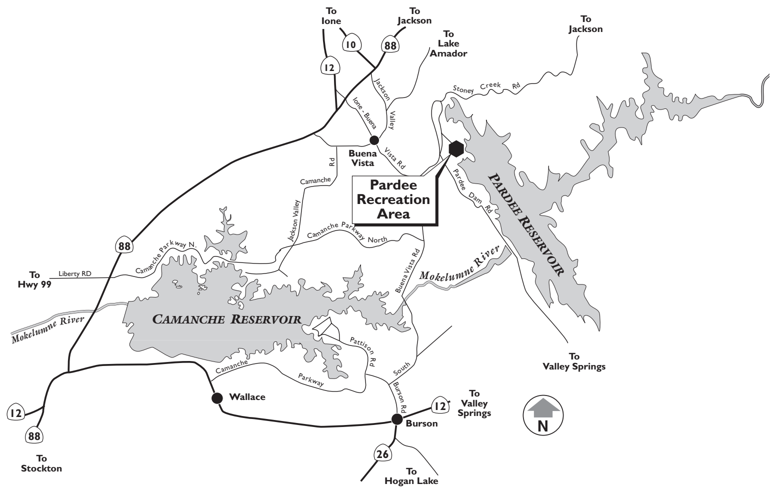

Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Pardee Reservoir is the water source for Pardee Recreation Area. The Recreation Area is served by a state-of-the-art ultrafiltration membrane water treatment facility. Ultrafiltration can remove particles as small as 0.01 microns. The distribution system is served by a 97,000 gallon water storage tank. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Pardee Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2000.

In order to ensure that the water is safe to drink, the USEPA and DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public or Maximum Contaminant Level Goals as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

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Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in the system in 2000.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is waived by the DHS except for fluoride (once), nitrate (annually) and nitrite (once every three years).

Monitoring was waived by the DHS for Lead and Copper at the consumer taps. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. The DHS has waived radiological monitoring for Pardee Recreation Area.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides, which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. The DHS has waived monitoring of SOCs for Pardee Recreation Area.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The DHS has waived monitoring of VOCs for Pardee Recreation Area.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is waived by the DHS, except Iron and Manganese were monitored once in 1997.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated.

Pardee Recreation Area 2000 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2000 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1, through December 31, 2000. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Turbidity (NTU)	TT = 5 NTU	NS	0.05	0.02 – 0.05		Soil erosion
	TT = percentage of samples <0.5 NTU	NS	100%	N/A		

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Organic Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Trihalomethanes (μg/L)	100	NS	66	58 – 74		By-product of drinking water chlorination

Secondary Parameters	MCL	Level Found	Sample Date	Typical Sources
Corrosivity	Non-corrosive	Non-corrosive	February 1997	Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Turbidity (NTU)	5	0.02 – 0.05		Soil erosion

Unregulated Contaminants	MCLG	Average	Range	Typical Sources
Bromodichloromethane (μg/L)	0	2.1	2.0 – 2.2	By-product of drinking water chlorination
Chloroform (μg/L)	0	64	56 – 71	By-product of drinking water chlorination

Other Parameters	Level Found	Sample Date	Other Parameters	Level Found	Sample Date
Alkalinity, bicarbonate (mg/L)	18	February 1997	Magnesium (mg/L)	1.3	February 1997
Calcium (mg/L)	4.1	February 1997	Sodium (mg/L)	5.4	February 1997
Hardness (mg/L)	13	February 1997			

Key

MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
NS = No Standards
NTU = Nephelometric Turbidity Units
PHG = Public Health Goal
TT = Treatment Technique
μg/L = micrograms per liter, or parts per billion (ppb)

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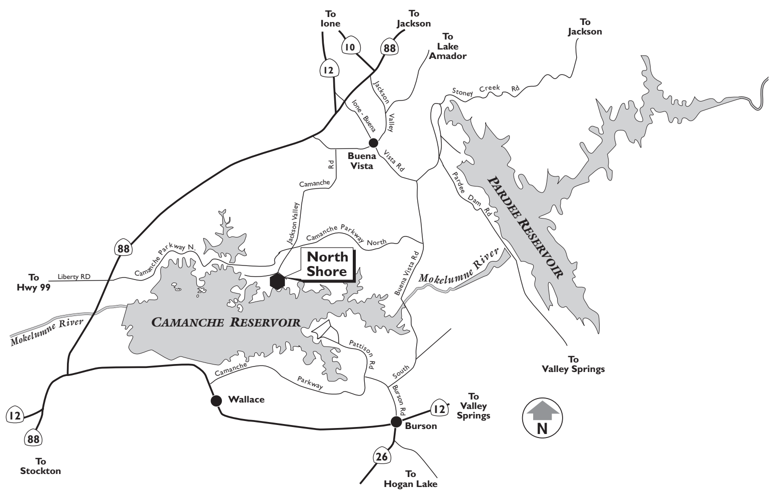
CAMANCHE NORTH SHORE 2001 WATER QUALITY ANNUAL REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

The Park Advisory Board meets in March, July and November at Pardee Center to discuss matters relating to water quality. For exact dates and times, please call (209) 772-8203. Public participation is encouraged.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Three deep wells are the water sources for Camanche North Shore Recreation Area. Water is treated at the Camanche North Shore Water Treatment Plant. Treatment includes: chlorination, potassium permanganate addition for iron and manganese removal, and filtration. The older finished water tank was refurbished and placed back in service in 2001. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Camanche North Shore Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2001.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (EPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

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Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in our system in 2001.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 36 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS). Fluoride samples were taken from the source waters.

Lead and copper were monitored in 2001, though results were below reportable levels at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. The most recent radioactve sampling of source water was performed in 2001. Results were within standards.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. SOCs are monitored to determine sources of industrial and agricultural contamination. Atrazine and Simazine are monitored once every six years and were not detected during the last monitoring in 2000. The DHS waived monitoring requirements for the remaining SOCs.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. No detectable levels of VOCs (including MTBE) were found in 2001. The DHS requires monitoring of VOCs once every three years.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is required once every 36 months except Thiobencarb which is waived by the DHS. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated.

Camanche North Shore 2001 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2001 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2001. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants is not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Radioactive Contaminants						
Alpha activity (pCi/L)	15	NS	1.3	ND–6	2001	Erosion of natural deposits
Beta activity (pCi/L)	50	NS	8	6–11	2001	Decay of man-made and natural deposits
Organic Contaminants						
Trihalomethanes (µg/L)	100	NS	20	16–27		By-product of drinking water chlorination

Secondary Parameters	MCL	Average	Range	Sample Date	Violation	Typical Sources
Chloride (mg/L)	250	33	33	2000		Runoff/leaching from natural deposits; seawater influence
Color (color units)	15	5	5	2001		Naturally occurring organic materials
Corrosivity	Non-corrosive	Non-corrosive				Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Odor–Threshold (TON)	3	1	1	2001		Naturally occurring organic materials
Specific Conductance (µmho/cm)	1600	430	430	2000		Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	11	11	2000		Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (mg/L)	1000	260	260	2000		Runoff/leaching from natural deposits
Turbidity (NTU)	5 NTU	NS	0.2	2000		Soil erosion

Unregulated Contaminants	MCLG	Average	Range	Typical Sources
Boron (mg/L)	AL = 1	0.22	0.21–0.23	Runoff/leaching from natural deposits

Other Parameters*	Level Found	Other Parameters*	Level Found
Alkalinity, bicarbonate (mg/L)	139	Sodium (mg/L)	27–29
Alkalinity, carbonate (mg/L)	1	Hardness (mg/L)	120
Calcium (mg/L)	31–32	Boron (mg/L)	0.21–0.23
Magnesium (mg/L)	5.2–5.6	Potassium (mg/L)	6.6–7.0

*One sample collected during 1999 from treated water.

Key

AL = Regulatory Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
N/A = Not Applicable
ND = Not Detected.
NS = No Standards
NTU = Nephelometric Turbidity Units
pCi/L = picoCuries per liter (a measure of radioactivity)
PHG = Public Health Goal
TON = Threshold Odor Number
µg/L = micrograms per liter, or parts per billion (ppb)
µmhos/cm = micro mhos per centimeter (measure of conductivity)

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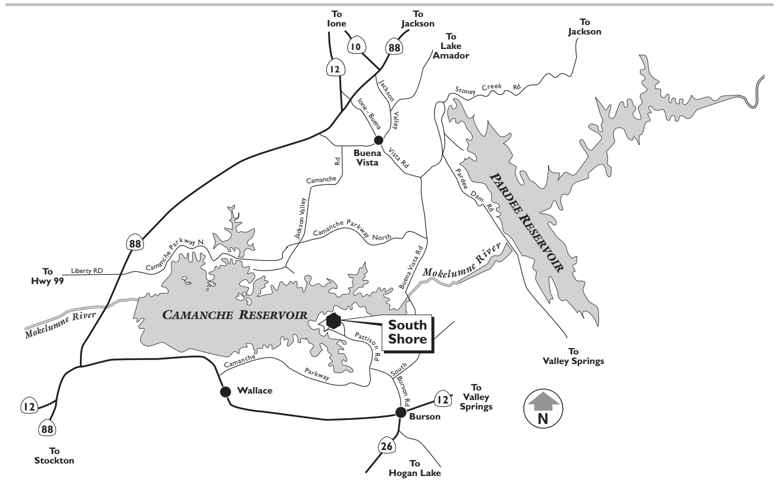
CAMANCHE SOUTH SHORE 2001 WATER QUALITY ANNUAL REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

The Park Advisory Board meets in March, July and November at Pardee Center to discuss matters relating to water quality. For exact dates and times, please call (209) 772-8203. Public participation is encouraged.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Camanche Reservoir is the water source for Camanche South Shore Recreation Area. The Recreation Area is served by Camanche South Shore Water Treatment Plant. Treatment includes: chlorination, coagulation, and filtration. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Camanche South Shore Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2001.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Current test methods do not allow us to determine if the organisms are dead or

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if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found one coliform bacteria sample with detectable levels in our system in 2001.

Inorganic Contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 12 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS). An aluminum sample was taken from treated water.

Lead and copper were monitored in 2001 at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. Radiological sampling of source water was performed in 2001. Results were within standards.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. SOCs are monitored to determine sources of industrial and agricultural contamination. The DHS waived monitoring requirements for SOCs.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The latest monitoring occurred in 1999 and no detectable levels of VOCs (including MTBE) were found. The DHS requires monitoring of VOCs once every three years.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is required once every 12 months except Thiobencarb which is waived by the DHS. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated. General minerals and chemicals are monitored once a year as required by the DHS.

Camanche South Shore 2001 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2001 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1, through December 31, 2001. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Turbidity (NTU)	TT = 5 NTU TT = 95 percent of samples <0.5 NTU	NS NS	0.3 100%	N/A N/A		Soil erosion

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Radioactive Contaminants						
Alpha activity (pCi/L)	15	NS	ND	ND–2	2001	Erosion of natural deposits
Copper and Lead						
Copper (mg/L)	AL = 1.3	0.17	90^{th} percentile = 0.39	No sites above the AL out of 5 sites sampled	2001	Corrosion of household plumbing
Lead (µg/L)	AL = 15	2	90^{th} percentile = 12	No sites above the AL out of 5 sites sampled	2001	Corrosion of household plumbing
Organic Contaminants						
Trihalomethanes (µg/L)	100	NS	34	27–49	2001	By-product of drinking water chlorination

Secondary Parameters	MCL	Average	Range	Sample Date	Violation	Typical Sources
Chloride (mg/L)	250	3.2	3.2	2000		Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive				Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Odor–Threshold (TON)	3	1	1	2001		Naturally-occurring organic materials
Specific Conductance (µmho/cm)	1600	54.4	54.4	2001		Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	2.2	2.2	2001		Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (mg/L)	1000	37	37	2001		Runoff/leaching from natural deposits
Turbidity (NTU)	5 NTU	0.11	0.11	2001		Soil erosion

Other Parameters*	Level Found	Other Parameters*	Level Found
Alkalinity, bicarbonate (mg/L)	18	Magnesium (mg/L)	1.3–1.4
Calcium (mg/L)	4.5–5.0	Potassium (mg/L)	0.7
Hardness (mg/L)	20	Sodium (mg/L)	2.4–2.6

*One sample collected during 2000 from treated water.

Key

AL = Regulatory Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
N/A = Not Applicable

ND = Not Detected.
NS = No Standards
NTU = Nephelometric Turbidity Units
pCi/L = picoCuries per liter (a measure of radioactivity)
PHG = Public Health Goal

TON = Threshold Odor Number
TT = Treatment Technique
µmhos/cm = micro mhos per centimeter, measure of conductivity
µg/L = micrograms per liter, or parts per billion (ppb)
90^{th} Percentile = 90% of samples had lower values than indicated

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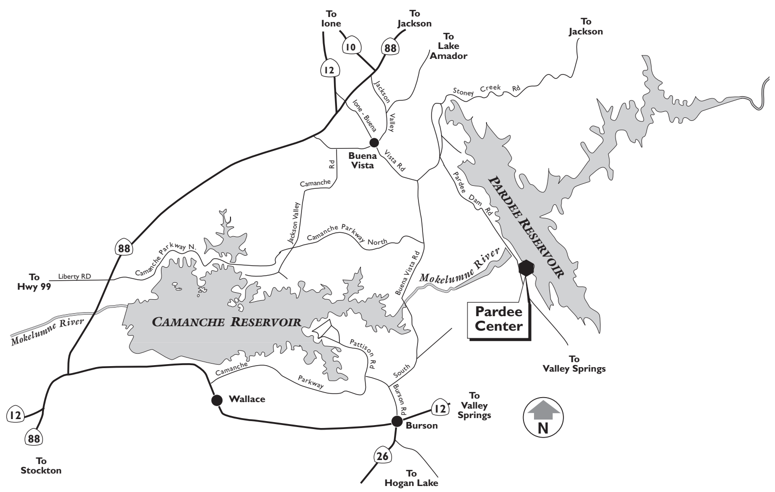

Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Pardee Reservoir is the water source for Pardee Center. Pardee Center has a dual water distribution system. The non-potable system serves the fire hydrants, irrigation system, chemical buildings, and various other uses throughout Pardee Center. Pardee Center is served by a state-of-the-art nanofiltration membrane water treatment facility. Nanofiltration can remove particles as small as 0.001 microns. Water treatment also includes the addition of soda ash for corrosion control. The distribution system is served by a 13,900 gallon water storage tank. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Pardee Center water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2001.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public or Maximum Contaminant Level Goals as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

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Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Pardee Center WTP does remove cryptosporidium and giardia as their sizes are larger (crypto 3-5 micron, giardia 7-14 micron) than the membrane which is 0.001 micron. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 12 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS).

Lead and copper were last monitored in 2001 at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. Monitoring of radiological contaminants was waived by the DHS.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides, which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. The DHS has waived monitoring of SOCs for Pardee Center.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The latest monitoring in 2001 showed no detection of VOCs including MTBE.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of parameters with secondary MCLs was waived by the DHS.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated. General minerals and chemicals are monitored once a year as required by the DHS.

Pardee Center 2001 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2001 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1, through December 31, 2001. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Total coliforms	One coliform positive	(0)	One positive sample	ND–one		Naturally present in environment
Turbidity (NTU)	TT = 5 NTU TT = percentage of samples <0.5 NTU	NS NS	0.1 100%	N/A N/A		Soil erosion

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Radiological Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Alpha activity (pCi/L)	15	(0)	<1	<1–2	1999	Erosion of natural deposits
Beta activity (pCi/L)	50	(0)	6	6	1999	Decay of natural and man-made deposits
Organic Contaminants						
Trihalomethanes (µg/L)	100	NS	3	2–5		By-product of drinking water chlorination

Secondary Parameters	MCL	Average	Range	Typical Sources
Chloride (mg/L)	250	2.1	2.1	Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive		Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Odor–Threshold (TON)	3	1.1	1.1	Naturally occurring organic materials
Specific Conductance (µmho/cm)	1600	38	38	Substances that form ions when in water; seawater influence
Total Dissolved Solids (mg/L)	1000	29	29	Runoff/leaching from natural deposits
Turbidity (NTU)	5	0.4	0.4	Soil erosion

Other Parameters	Average	Range	Other Parameters	Average	Range
Alkalinity, bicarbonate (mg/L)	16	N/A	Magnesium (mg/L)	0.5	0.4–0.6
Calcium (mg/L)	1.9	1.7–2.0	Potassium (mg/L)	0.38	0.36–0.40
Hardness (mg/L)	6.4	5.2 – 7.5	Sodium (mg/L)	5.6	5.4–5.7

Key

AL = Regulatory Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
N/A = Not Applicable
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NS = No Standards
NTU = Nephelometric Turbidity Units
pCi/L = picoCuries per liter (a measure of radioactivity)
PHG = Public Health Goal
TON = Threshold Odor Number
TT = Treatment Technique
µmhos/cm = micro mhos per centimeter, measure of conductivity
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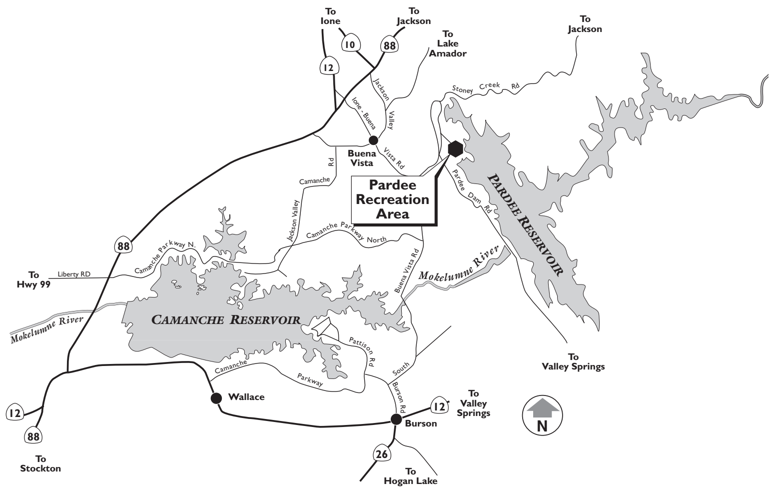
PARDEE RECREATION AREA
2001 WATER QUALITY ANNUAL REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Pardee Reservoir is the water source for Pardee Recreation Area. The Recreation Area is served by a state-of-the-art ultrafiltration membrane water treatment facility. Ultrafiltration can remove particles as small as 0.01 microns. The distribution system is served by a 97,000 gallon water storage tank. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Pardee Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2001.

In order to ensure that the water is safe to drink, the USEPA and DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public or Maximum Contaminant Level Goals as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

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Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Pardee Recreation WTP does remove cryptosporidium and giardia as their sizes are larger (crypto 3-5 micron, giardia 7-14 micron) than the membrane which is 0.01 micron. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion

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of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in the system in 2001.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is waived by the DHS except for fluoride (once), nitrate (annually) and nitrite (once every three years).

Monitoring was waived by the DHS for Lead and Copper at the consumer taps. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. The DHS has waived radiological monitoring for Pardee Recreation Area.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides, which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. The DHS has waived monitoring of SOCs for Pardee Recreation Area.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The DHS has waived monitoring of VOCs for Pardee Recreation Area.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is waived by the DHS, except Iron and Manganese were monitored once in 1997.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated.

Pardee Recreation Area 2001 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2001 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1, through December 31, 2001. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Turbidity (NTU)	TT = 5 NTU	NS	0.05	0.02–0.05		Soil erosion
	TT = percentage of samples <0.5 NTU	NS	100%	N/A		

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Organic Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Trihalomethanes (µg/L)	100	NS	52	44–58		By-product of drinking water chlorination

Secondary Parameters	MCL	Level Found	Sample Date	Typical Sources
Corrosivity	Non-corrosive	Non-corrosive	February 1997	Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Turbidity (NTU)	5	0.02 – 0.05	2001	Soil erosion

Other Parameters	Level Found	Sample Date	Other Parameters	Level Found	Sample Date
Alkalinity, bicarbonate (mg/L)	18	February 1997	Magnesium (mg/L)	1.3	February 1997
Calcium (mg/L)	4.1	February 1997	Sodium (mg/L)	5.4	February 1997
Hardness (mg/L)	13	February 1997			

Key

MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
NS = No Standards
NTU = Nephelometric Turbidity Units
PHG = Public Health Goal
TT = Treatment Technique
µg/L = micrograms per liter, or parts per billion (ppb)

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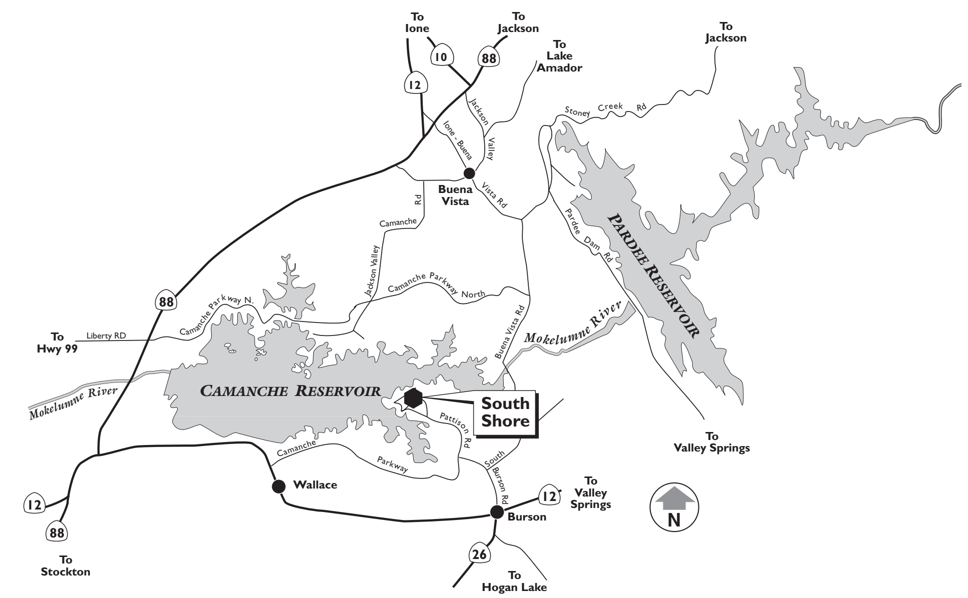
CAMANCHE SOUTH SHORE 2002 WATER QUALITY ANNUAL REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

The Park Advisory Board meets in March, July and November at Pardee Center to discuss matters relating to water quality. For exact dates and times, please call (209) 772-8203. Public participation is encouraged.

The Public Health Security and Bioterrorism Response Act of 2002 requires community water systems to conduct vulnerability assessments and develop/revise Emergency Response Plans. In compliance with the Act, the District has prepared vulnerability assessments of the Mokelumne Area systems. In addition, revision of current Emergency Response Plans is in-progress for completion within the mandated guidelines of the Act. Questions regarding District compliance with the Act should be referred to the Security Section at (510) 287-1327.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Camanche Reservoir is the water source for Camanche South Shore Recreation Area. The Recreation Area is served by Camanche South Shore Water Treatment Plant. Treatment includes: chlorination, coagulation, and filtration. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities.

The California Department of Health Services (DHS) sets water quality requirements for the Camanche South Shore Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2002.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The California Department of Health Services (DHS) requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District reservoir, and found that the source is most vulnerable to the following activities: boating and marina gas stations, wastewater treatment and disposal facilities, historic gas stations, known contaminant plumes and historical mining. In 2002, no contaminants associated with these activities were detected in EBMUD's drinking water.

The detailed results of this assessment can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton DHS office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found one coliform bacteria sample with detectable levels in our system in 2002.

Inorganic Contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 12 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS). An aluminum sample was taken from treated water.

Lead and copper were monitored in 2001 at consumer taps, as required by the Lead & Copper Rule. Results were within standards. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. Radiological sampling of source water was performed in 2001. Results were within standards.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. SOCs are monitored to determine sources of industrial and agricultural contamination. The DHS waived monitoring requirements for SOCs.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The latest monitoring occurred in 2002 and no detectable levels of VOCs (including MTBE) were found in the drinking water intake. MTBE was detected in the samples at the surface (not the depths) of the marina in addition to other gasoline-related contaminants, i.e., toluene and xylenes. The DHS requires monitoring of VOCs once every three years.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is required once every 12 months except Thiobencarb which is waived by the DHS. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated. General minerals and chemicals are monitored once a year as required by the DHS.

Camanche South Shore 2002 Water Quality Data

The table at right lists all the drinking water contaminants that we detected during the 2002 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2002. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Camanche South Shore 2002 Water Quality Data

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Total coliforms	One coliform positive	(0)	One positive sample	ND–one		Naturally present in the environment
Turbidity (NTU)	TT = 1 NTU	NS	0.1	0.05–0.10		Soil erosion
	TT = 95 percent of samples <0.3 NTU	NS	100%	N/A		
Radioactive Contaminants						
Alpha activity (pCi/L)	15	NS	ND	ND–2	2001	Erosion of natural deposits
Copper and Lead						
Copper (mg/L)	AL = 1.3	0.17	90^{th} percentile = 0.39	No sites above the AL out of 5 sites sampled	2001	Corrosion of household plumbing
Lead (μg/L)	AL = 15	2	90^{th} percentile = 12	No sites above the AL out of 5 sites sampled	2001	Corrosion of household plumbing
Organic Contaminants						
Trihalomethanes (μg/L)	100	NS	28	22–36	2001	By-product of drinking water chlorination

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Secondary Parameters	MCL	Average	Range	Sample Date	Violation	Typical Sources
Chloride (mg/L)	250	3.4	3.4	2002		Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive				Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Odor–Threshold (TON)	3	2.5	2.5	2002		Naturally-occurring organic materials
Specific Conductance (μmho/cm)	1600	55.4	55.4	2002		Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	2.2	2.2	2002		Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (mg/L)	1000	32	32	2002		Runoff/leaching from natural deposits
Turbidity (NTU)	5 NTU	0.10	0.10	2002		Soil erosion

Other Parameters	Level Found	Other Parameters	Level Found
Alkalinity, bicarbonate (mg/L)	19	Potassium (mg/L)	0.6
Calcium (mg/L)	5.6	Silica (mg/L)	3.8
Hardness (mg/L)	20	Sodium (mg/L)	2.5
Magnesium (mg/L)	1.4		

Key

AL = Regulatory Action Level	**ND** = Not Detected.	**PHG** = Public Health Goal
MCL = Maximum Contaminant Level	**NS** = No Standards	**TON** = Threshold Odor Number
MCLG = Maximum Contaminant Level Goal	**NTU** = Nephelometric Turbidity Units	**μg/L** = micrograms per liter, or parts per billion (ppb)
mg/L = milligrams per liter, or parts per million (ppm)	**pCi/L** = picoCuries per liter (a measure of radioactivity)	**μmhos/cm** = micro mhos per centimeter (measure of conductivity)
N/A = Not Applicable		

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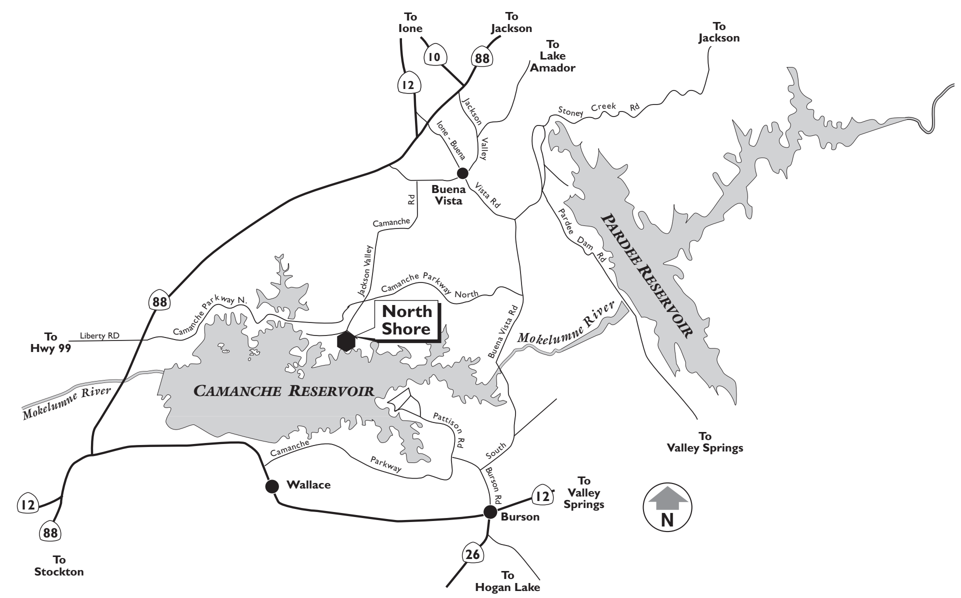
CAMANCHE NORTH SHORE 2002 WATER QUALITY ANNUAL REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

The Park Advisory Board meets in March, July and November at Pardee Center to discuss matters relating to water quality. For exact dates and times, please call (209) 772-8203. Public participation is encouraged.

The Public Health Security and Bioterrorism Response Act of 2002 requires community water systems to conduct vulnerability assessments and develop/revise Emergency Response Plans. In compliance with the Act, the District has prepared vulnerability assessments of the Mokelumne Area systems. In addition, revision of current Emergency Response Plans is in-progress for completion within the mandated guidelines of the Act. Questions regarding District compliance with the Act should be referred to the Security Section at (510) 287-1327.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Three deep wells are the water sources for Camanche North Shore Recreation Area. Water is treated at the Camanche North Shore Water Treatment Plant. Treatment includes: chlorination, potassium permanganate addition for iron and manganese removal, and filtration. The older finished water tank was refurbished and placed back in service in 2002. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Camanche North Shore Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All primary water quality regulations were met in 2002.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The California Department of Health Services (DHS) requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District aquifer, and found that the source is most vulnerable to gas stations. In 2002, no contaminants associated with these activities were detected in EBMUD's drinking water sources.

The detailed results of this assessment can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton DHS office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (EPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in our system in 2002.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 36 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS). Fluoride samples were taken from the source waters.

Lead and copper were monitored in 2001. Results were below reportable levels at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. The most recent radioactve sampling of source water was performed in 2001. Results were within standards.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. SOCs are monitored to determine sources of industrial and agricultural contamination. Atrazine and Simazine are monitored once every three years and were not detected during the last monitoring in 2000. The DHS waived monitoring requirements for the remaining SOCs.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. Detectable levels of VOCs well below DHS health-related limits (ethylbenzene and xylenes) were found in 2002 due to the rehabilitation of the old water tank. Quarterly monitoring will be done until detectable levels are eliminated at the old water tank.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is required once every 36 months except Thiobencarb which is waived by the DHS. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated.

Camanche North Shore 2002 Water Quality Data

The table at right lists all the drinking water contaminants that we detected during the 2002 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2002. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants is not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Camanche North Shore 2002 Water Quality Data

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Inorganic Contaminants						
Barium (mg/L)	1.0	–	0.22	ND–0.49	April '02	Discharge of oil drilling wastes and from metal refineries; erosion of natural deposits
Fluoride (mg/L)	1.0	–	0.1	ND–0.12	April '02	Erosion of natural deposits; discharge from fertilizer and aluminum factories
Radioactive Contaminants						
Alpha activity (pCi/L)	15	NS	1.3	ND–6	2001	Erosion of natural deposits
Beta activity (pCi/L)	50	NS	8	6–11	2001	Decay of man-made and natural deposits
Organic Contaminants						
Ethylbenzene	700	300	<0.5–1.0			Discharges from petroleum refineries; industrial chemical factories
Trihalomethanes (μg/L)	100	NS	25	20–38		By-product of drinking water chlorination
Xylenes	1750	1800	1.3–2.8			Discharges from petroleum refineries and chemical factories; fuel solvent

Secondary Parameters	MCL	Average	Range	Sample Date	Violation	Typical Sources
Chloride (mg/L)	250	10	10	April '02		Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive				Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Odor–Threshold (TON)	3	5*	4–5	April '02	X	Naturally occurring organic materials
Specific Conductance (μmho/cm)	1600	335	335	April '02		Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	37	37	April '02		Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (mg/L)	1000	260	260	April '02		Runoff/leaching from natural deposits
Turbidity (NTU)	5 NTU	NS	0.2	2000		Soil erosion

*Odor is measured by a panel of persons trained to detect odors in water, though their responses may vary. The panel described the odor exceeding the secondary standard as "grassy", though the wells used for the water source were described by "rubber" and "sulfur".

Unregulated Contaminants	MCLG	Average	Range	Typical Sources
Boron (mg/L)	AL = 1	0.5	0.1–0.9	Runoff/leaching from natural deposits

Other Parameters†	Level Found	Other Parameters*	Level Found
Alkalinity, bicarbonate (mg/L)	100	Sodium (mg/L)	23
Alkalinity, carbonate (mg/L)	1	Hardness (mg/L)	100
Calcium (mg/L)	25–37	Silica (mg/L)	66
Magnesium (mg/L)	5.2	Potassium (mg/L)	5.8

†One sample collected during 1999 from treated water.

Key

AL = Regulatory Action Level	**ND** = Not Detected.	**PHG =** Public Health Goal
MCL = Maximum Contaminant Level	**NS** = No Standards	**TON** = Threshold Odor Number
MCLG = Maximum Contaminant Level Goal	**NTU** = Nephelometric Turbidity Units	**μg/L** = micrograms per liter, or parts per billion (ppb)
mg/L = milligrams per liter, or parts per million (ppm)	**pCi/L** = picoCuries per liter (a measure of radioactivity)	**μmhos/cm** = micro mhos per centimeter (measure of conductivity)
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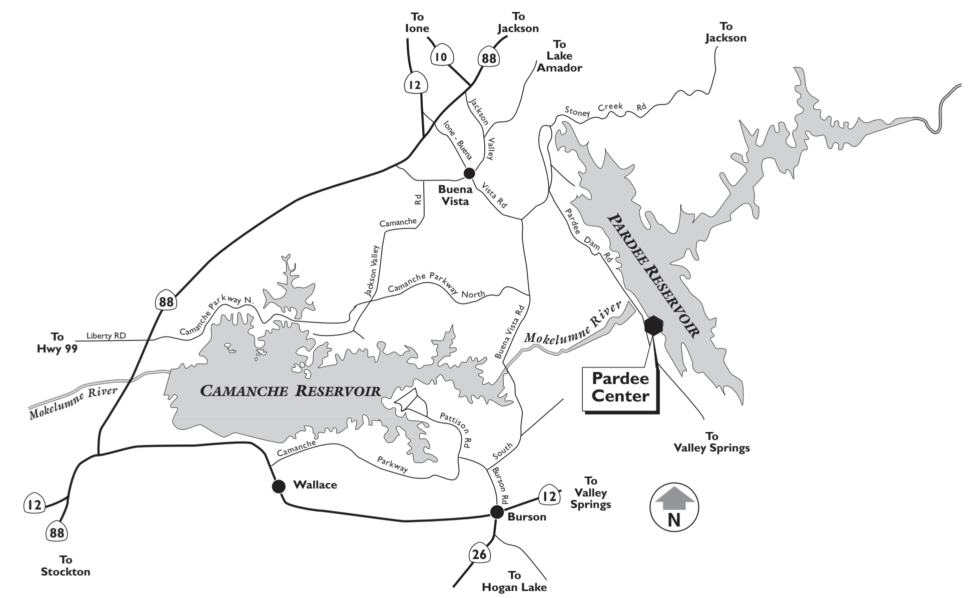

Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

The Public Health Security and Bioterrorism Response Act of 2002 requires community water systems to conduct vulnerability assessments and develop/revise Emergency Response Plans. In compliance with the Act, the District has prepared vulnerability assessments of the Mokelumne Area systems. In addition, revision of current Emergency Response Plans is in-progress for completion within the mandated guidelines of the Act. Questions regarding District compliance with the Act should be referred to the Security Section at (510) 287-1327.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Pardee Reservoir is the water source for Pardee Center. Pardee Center has a dual water distribution system. The non-potable system serves the fire hydrants, irrigation system, chemical buildings, and various other uses throughout Pardee Center. Pardee Center is served by a state-of-the-art nanofiltration membrane water treatment facility. Nanofiltration can remove particles as small as 0.001 microns. Water treatment also includes the addition of soda ash for corrosion control. The distribution system is served by a 13,900 gallon water storage tank. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Pardee Center water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2002.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The California Department of Health Services (DHS) requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District reservoir, and found that the source is most vulnerable to boating and marina gas stations. In 2002, no contaminants associated with these activities were detected in EBMUD's drinking water.

The detailed results of this assessment can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton DHS office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public or Maximum Contaminant Level Goals as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Pardee Center WTP does remove cryptosporidium and giardia as their sizes are larger (crypto 3-5 micron, giardia 7-14 micron) than the membrane which is 0.001 micron. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 12 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS).

Lead and copper were last monitored in 2001 at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. Monitoring of radiological contaminants was waived by the DHS.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides, which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. The DHS has waived monitoring of SOCs for Pardee Center.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The latest monitoring in 2002 showed no detection of VOCs including MTBE.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of parameters with secondary MCLs was waived by the DHS. Odor sample taken on August 6, 2002 was analyzed with contaminated vessels or odorous water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated. General minerals and chemicals are monitored once a year as required by the DHS.

Pardee Center 2002 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2002 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2002. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Pardee Center 2002 Water Quality Data

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Turbidity (NTU)	TT = 1 NTU	NS	0.1	0.05–0.10		Soil erosion
	TT = 95 percent of samples <0.3 NTU	NS	100%	N/A		

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Radioactive Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Alpha activity (pCi/L)	15	(0)	<1	<1–2	1999	Erosion of natural deposits
Beta activity (pCi/L)	50	(0)	6	6	1999	Decay of natural and man-made deposits
Organic Contaminants						
Trihalomethanes (µg/L)	100	NS	4	2–6		By-product of drinking water chlorination

Secondary Parameters	MCL	Average	Range		Typical Sources
Chloride (mg/L)	250	2.0	1.3–2.4		Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive			Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Odor–Threshold (TON)	3	5	5	Aug 6, '02	Naturally occurring organic materials
Specific Conductance (µmho/cm)	1600	37	37		Substances that form ions when in water; seawater influence
Total Dissolved Solids (mg/L)	1000	11	11		Runoff/leaching from natural deposits
Turbidity (NTU)	5	0.05	ND–0.3		Soil erosion

Other Parameters	Average	Range	Other Parameters	Average	Range
Alkalinity, bicarbonate (mg/L)	15	15	Potassium (mg/L)	0.32	0.28–0.36
Calcium (mg/L)	1.9	1.9	Silica (mg/L)	9.5	9.0–10.0
Hardness (mg/L)	6.0	6.0	Sodium (mg/L)	4.8	4.6–5.1
Magnesium (mg/L)	0.6	05–0.6			

Key

AL = Regulatory Action Level	**ND** = Not Detected.	**PHG =** Public Health Goal
MCL = Maximum Contaminant Level	**NS** = No Standards	**TON** = Threshold Odor Number
MCLG = Maximum Contaminant Level Goal	**NTU** = Nephelometric Turbidity Units	**µg/L** = micrograms per liter, or parts per billion (ppb)
mg/L = milligrams per liter, or parts per million (ppm)	**pCi/L** = picoCuries per liter (a measure of radioactivity)	**µmhos/cm** = micro mhos per centimeter (measure of conductivity)
N/A = Not Applicable		

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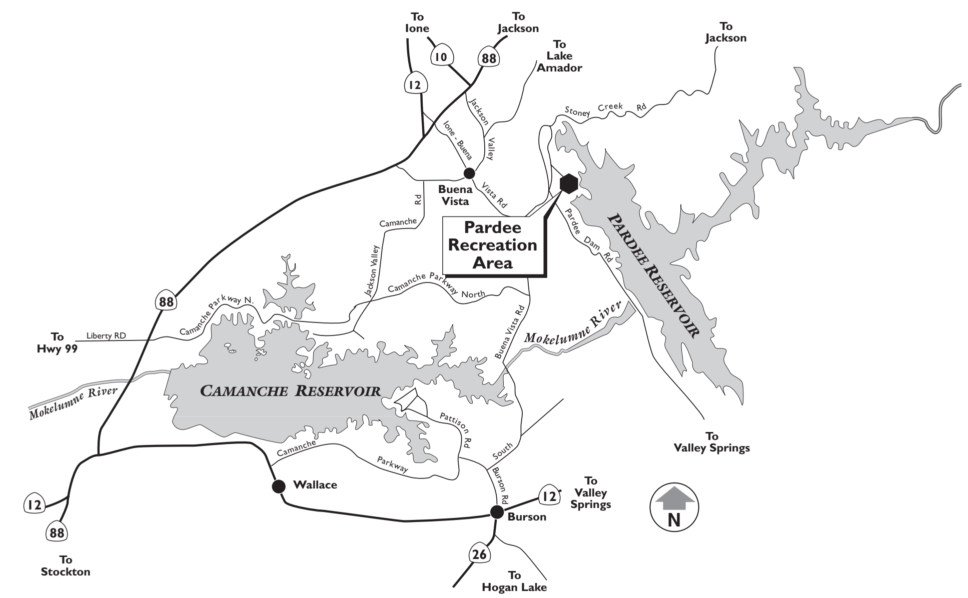
PARDEE RECREATION AREA
2002 WATER QUALITY ANNUAL REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

The Public Health Security and Bioterrorism Response Act of 2002 requires community water systems to conduct vulnerability assessments and develop/revise Emergency Response Plans. In compliance with the Act, the District has prepared vulnerability assessments of the Mokelumne Area systems. In addition, revision of current Emergency Response Plans is in-progress for completion within the mandated guidelines of the Act. Questions regarding District compliance with the Act should be referred to the Security Section at (510) 287-1327.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Pardee Reservoir is the water source for Pardee Recreation Area. The Recreation Area is served by a state-of-the-art ultrafiltration membrane water treatment facility. Ultrafiltration can remove particles as small as 0.01 microns. The distribution system is served by a 97,000 gallon water storage tank. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Pardee Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2002.

In order to ensure that the water is safe to drink, the USEPA and DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The California Department of Health Services (DHS) requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District reservoir, and found that the source is most vulnerable to gas stations. In 2002, no contaminants associated with these activities were detected in EBMUD's drinking water.

The detailed results of this assessment can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton DHS office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public or Maximum Contaminant Level Goals as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Pardee Recreation WTP does remove cryptosporidium and giardia as their sizes are larger (crypto 3-5 micron, giardia 7-14 micron) than the membrane which is 0.01 micron. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in the system in 2002.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is waived by the DHS except for fluoride (once), nitrate (annually) and nitrite (once every three years).

Monitoring was waived by the DHS for Lead and Copper at the consumer taps. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. The DHS has waived radiological monitoring for Pardee Recreation Area.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides, which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. The DHS has waived monitoring of SOCs for Pardee Recreation Area.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The DHS has waived monitoring of VOCs for Pardee Recreation Area.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is waived by the DHS, except Iron and Manganese were monitored once in 1997.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated.

Pardee Recreation Area 2002 Water Quality Data

The table at right lists all the drinking water contaminants that we detected during the 2002 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2002. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Pardee Recreation Area 2002 Water Quality Data

Primary Contaminants	MCL	PHG (MCLG)	Level Found	Range	Sample Date	Typical Sources
Turbidity (NTU)	TT = 1 NTU	NS	0.15	0.05–0.15		Soil erosion
	TT = 95 percent of samples <0.3 NTU	NS	100%	N/A		

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Organic Contaminants						
Toluene (µg/L)	150	150	1.0	ND–1.0	March '02	Discharge from petroleum and chemical factories; underground gas tank leaks
Trihalomethanes (µg/L)	100	NS	50	31–66		By-product of drinking water chlorination
Xylenes (µg/L)	1800	1800	1.2	ND–1.2	March '02	Discharge from petroleum and chemical factories; fuel solvent

Secondary Parameters	MCL	Level Found	Sample Date	Typical Sources
Chloride (mg/L)	250	2.5	April '02	Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive		Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Sulfate (mg/L)	500	2	April '02	Runoff/leaching from natural deposits; industrial wastes
Turbidity (NTU)	5	0.05 – 0.15	2002	Soil erosion

Other Parameters	Level Found	Sample Date	Other Parameters	Level Found	Sample Date
Alkalinity, bicarbonate (mg/L)	16	April '02	Potassium (mg/L)	0.5	April '02
Calcium (mg/L)	4.3	April '02	Silica (mg/L)	10.2	April '02
Hardness (mg/L)	13	April '02	Sodium (mg/L)	5.4	April '02
Magnesium (mg/L)	1.3	April '02			

Key

AL = Regulatory Action Level	**ND** = Not Detected.	**PHG =** Public Health Goal
MCL = Maximum Contaminant Level	**NS** = No Standards	**TON** = Threshold Odor Number
MCLG = Maximum Contaminant Level Goal	**NTU** = Nephelometric Turbidity Units	**µg/L** = micrograms per liter, or parts per billion (ppb)
mg/L = milligrams per liter, or parts per million (ppm)	**pCi/L** = picoCuries per liter (a measure of radioactivity)	**µmhos/cm** = micro mhos per centimeter (measure of conductivity)
N/A = Not Applicable		

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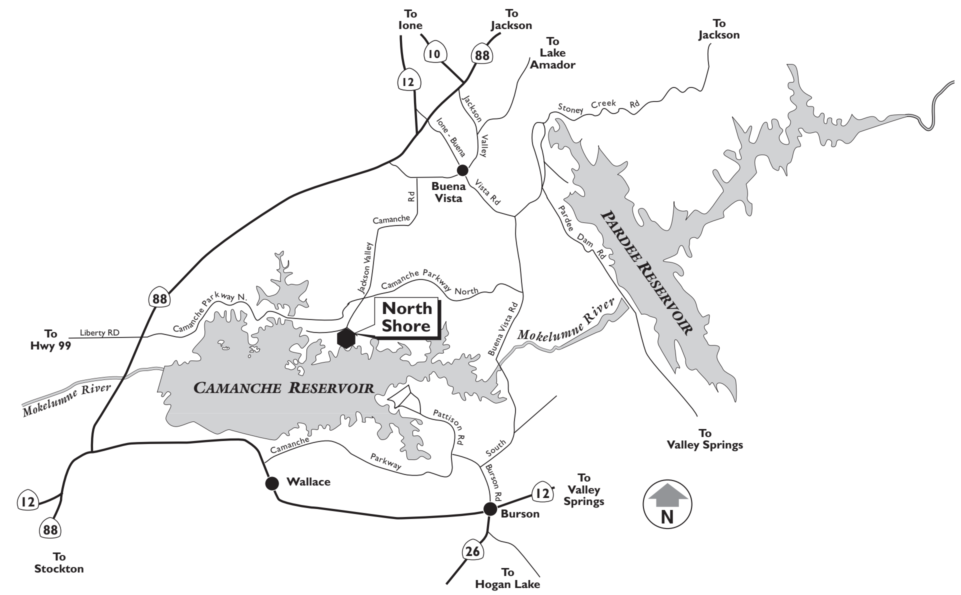
CAMANCHE NORTH SHORE 2003 CONSUMER CONFIDENCE REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

The Park Advisory Board meets in March, July and November at Pardee Center to discuss matters relating to water quality. For exact dates and times, please call (209) 772-8203. Public participation is encouraged.

The Public Health Security and Bioterrorism Response Act of 2003 requires community water systems to conduct vulnerability assessments and develop/revise Emergency Response Plans. In compliance with the Act, the District has prepared vulnerability assessments of the Mokelumne Area systems. In addition, revision of current Emergency Response Plans is in-progress for completion within the mandated guidelines of the Act. Questions regarding District compliance with the Act should be referred to the Security Section at (510) 287-1327.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Three deep wells are the water sources for Camanche North Shore Recreation Area. Water is treated at the Camanche North Shore Water Treatment Plant. Treatment includes: chlorination, potassium permanganate addition for iron and manganese removal, and filtration. The older finished water tank was refurbished and placed back in service in 2003. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Camanche North Shore Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All primary water quality regulations were met in 2003.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The California Department of Health Services (DHS) requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District aquifer, and found that the source is most vulnerable to gas stations. In 2003, no contaminants associated with these activities were detected in EBMUD's drinking water sources.

The detailed results of this assessment can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton DHS office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (EPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in our system in 2003.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming. The latest round of sampling occurred in 2002, and the next sampling is scheduled in 2005.

Sampling for all inorganic chemicals is required once every 36 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS). The latest round of sampling occurred in 2002, and the next sampling is scheduled for 2005. Fluoride samples were taken from the source waters.

Lead and copper were monitored in 2001 and the next sampling is scheduled in 2004. Results were below reportable levels at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. The most recent radioactive sampling of source water was performed in 2001. Results were within standards.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. SOCs are monitored to determine sources of industrial and agricultural contamination. Atrazine and Simazine are monitored once every three years and were not detected during the last monitoring in 2003. The DHS waived monitoring requirements for the remaining SOCs.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. Detectable levels of VOCs well below DHS health-related limits (ethylbenzene and xylenes) were found in 2003 due to the rehabilitation of the old water tank. Quarterly monitoring will be done until detectable levels are eliminated at the old water tank.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is required once every 36 months except Thiobencarb which is waived by the DHS. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated.

Camanche North Shore 2003 Water Quality Data

The table at right lists all the drinking water contaminants that we detected during the 2003 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2003. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants is not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Camanche North Shore 2003 Water Quality Data

Primary Contaminants	MCL	PHG (MCLG)	Average	Range	Sample Date	Typical Sources
Inorganic Contaminants						
Barium (mg/L)	1.0	–	0.22	ND–0.49	April '02	Discharge of oil drilling wastes and from metal refineries; erosion of natural deposits
Fluoride (mg/L)	1.0	–	0.1	ND–0.12	April '02	Erosion of natural deposits; discharge from fertilizer and aluminum factories
Radioactive Contaminants						
Alpha activity (pCi/L)	15	NS	1.3	ND–6	2001	Erosion of natural deposits
Beta activity (pCi/L)	50	NS	8	6–11	2001	Decay of man-made and natural deposits
Organic Contaminants						
Ethylbenzene (µg/L)	700	300	0.5	<0.5-0.69		Discharges from petroleum refineries; industrial chemical factories
Trihalomethanes (µg/L)	100	NS	21	20–22		By-product of drinking water chlorination
Xylenes (µg/L)	1750	1800	1.7	<0.5-2.3		Discharges from petroleum refineries and chemical factories; fuel solvent

Secondary Parameters	MCL	Average	Sample Date	Typical Sources
Chloride (mg/L)	250	10	April '02	Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive	April '02	Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Color, color units	15	4		Naturally occurring organic materials
Odor–Threshold (TON)	3	1.5		Naturally occurring organic materials
Specific Conductance (µmho/cm)	1600	335	April '02	Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	37	April '02	Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (mg/L)	1000	260	April '02	Runoff/leaching from natural deposits
Turbidity (NTU)	5	0.45	April '02	Soil runoff

Unregulated Contaminants	MCLG	Average	Range	Typical Sources
Boron (mg/L)	AL = 1	0.4	0.1–0.9	Runoff/leaching from natural deposits

Other Parameters	Level Found	Other Parameters	Level Found
Alkalinity, bicarbonate (mg/L)	100*	Sodium (mg/L)	28
Alkalinity, carbonate (mg/L)	1†	Hardness (mg/L)	100*
Calcium (mg/L)	31.8	Silica (mg/L)	66
Magnesium (mg/L)	5.3	Potassium (mg/L)	7.3

*One sample collected during 2002 from treated water.
†One sample collected during 1999 from treated water.

Key

AL = Regulatory Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
N/A = Not Applicable
ND = Not Detected.
NS = No Standards
NTU = Nephelometric Turbidity Units
pCi/L = picoCuries per liter (a measure of radioactivity)
PHG = Public Health Goal
TON = Threshold Odor Number
µg/L = micrograms per liter, or parts per billion (ppb)
µmhos/cm = micro mhos per centimeter (measure of conductivity)

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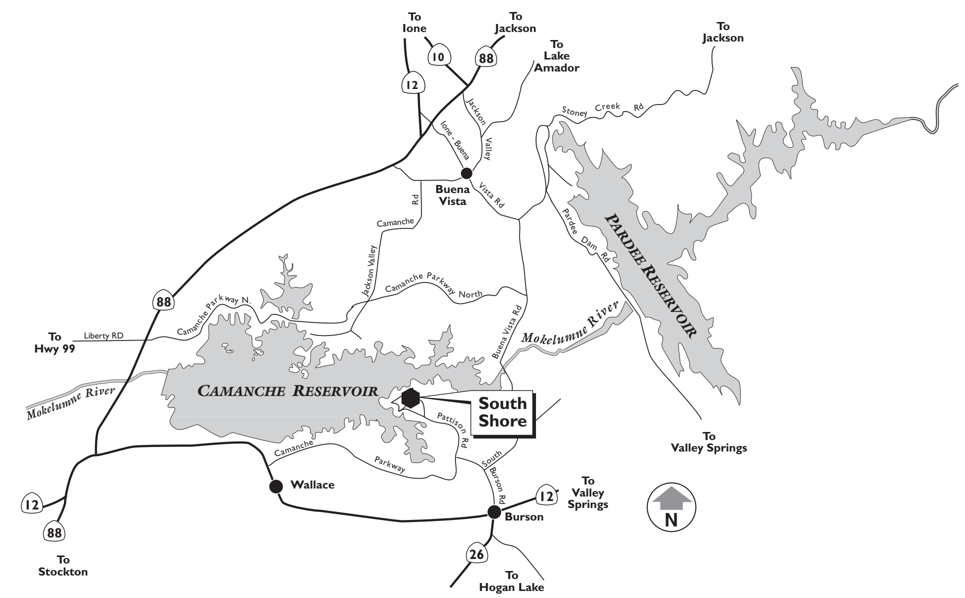

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This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

The Park Advisory Board meets in March, July and November at Pardee Center to discuss matters relating to water quality. For exact dates and times, please call (209) 772-8203. Public participation is encouraged.

The Public Health Security and Bioterrorism Response Act of 2003 requires community water systems to conduct vulnerability assessments and develop/revise Emergency Response Plans. In compliance with the Act, the District has prepared vulnerability assessments of the Mokelumne Area systems. In addition, revision of current Emergency Response Plans is in-progress for completion within the mandated guidelines of the Act. Questions regarding District compliance with the Act should be referred to the Security Section at (510) 287-1327.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Camanche Reservoir is the water source for Camanche South Shore Recreation Area. The Recreation Area is served by Camanche South Shore Water Treatment Plant. Treatment includes: chlorination, coagulation, and filtration. The water treatment facility and distribution system are operated by state certified water treatment operators. The distribution system is served by two 240,000 gallon storage tanks.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Camanche South Shore Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2003.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The California Department of Health Services (DHS) requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District reservoir, and found that the source is most vulnerable to the following activities: boating and marina gas stations, wastewater treatment and disposal facilities, historic gas stations, known contaminant plumes and historical mining. In 2003, no contaminants associated with these activities were detected in EBMUD's drinking water.

The detailed results of this assessment can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton DHS office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in our system in 2003.

Inorganic Contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 12 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS).

Lead and copper were monitored in 2001 at consumer taps, as required by the Lead & Copper Rule. Results were within standards. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. Radiological sampling of source water was performed in 2001 and the next round of sampling will be in 2005. Results were within standards.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. SOCs are monitored to determine sources of industrial and agricultural contamination. The DHS waived monitoring requirements for SOCs, except Simazine and Atrazine that are monitored once every three years.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The latest monitoring occurred in 2003 and no detectable levels of VOCs (including MTBE) were found in the drinking water intake or at the reservoir. The DHS granted a one-time 3-year waiver and the next VOC monitoring will be due in 2009.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is required once every 12 months except Thiobencarb which is waived by the DHS. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated. General minerals and chemicals are monitored once a year as required by the DHS.

Camanche South Shore 2003 Water Quality Data

The table at right lists all the drinking water contaminants that we detected during the 2003 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2003. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Camanche South Shore 2003 Water Quality Data

Primary Contaminants	MCL	PHG (MCLG)	Average	Range	Typical Sources
Turbidity (NTU)	TT = 1 NTU	NS	0.1	0.05–0.10	Soil runoff
	TT = 95 percent of samples <0.3 NTU	NS	100%	N/A	

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Copper and Lead	MCL	PHG (MCLG)	Average	Range	Typical Sources
Copper (mg/L)	AL = 1.3	0.17	90th percentile = 0.29	No sites above the AL out of 5 sites sampled	Corrosion of household plumbing
Lead (µg/L)	AL = 15	2	90th percentile = 12.8	No sites above the AL out of 5 sites sampled	Corrosion of household plumbing

Organic Contaminants	MCL	PHG (MCLG)	Average	Range	Typical Sources
Trihalomethanes (µg/L)	100	NS	24	23–24	By-product of drinking water chlorination
Haloacetic acids, 5 species (µg/L)	60	NS	24	23-24	By-product of drinking water chlorination

Secondary Parameters	MCL	Average	Violation	Typical Sources
Chloride (mg/L)	250	3.7		Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive		Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Color, color units	15	3		Naturally-occurring organic materials
Odor–Threshold (TON)	3	**3.5***	April 3, 2003	Naturally-occurring organic materials
Specific Conductance of water (µmho/cm)	1600	54.6		Substances that form ions when in of seawater influence
Sulfate (mg/L)	500	2		Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (mg/L)	1000	33		Runoff/leaching from natural deposits
Turbidity (NTU)	5	0.10		Soil runoff

*MCL exceedance for TON did not coincide with any odor complaints or detection by consumers.

Other Parameters	Level Found	Other Parameters	Level Found
Alkalinity, bicarbonate (mg/L)	18	Potassium (mg/L)	0.8
Calcium (mg/L)	5.1	Silica (mg/L)	3.9
Hardness (mg/L)	20	Sodium (mg/L)	2.9
Magnesium (mg/L)	1.4		

Key

AL = Regulatory Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
N/A = Not Applicable
ND = Not Detected.
NS = No Standards
NTU = Nephelometric Turbidity Units
pCi/L = picoCuries per liter (a measure of radioactivity)
PHG = Public Health Goal
TON = Threshold Odor Number
µg/L = micrograms per liter, or parts per billion (ppb)
µmhos/cm = micro mhos per centimeter (measure of conductivity)

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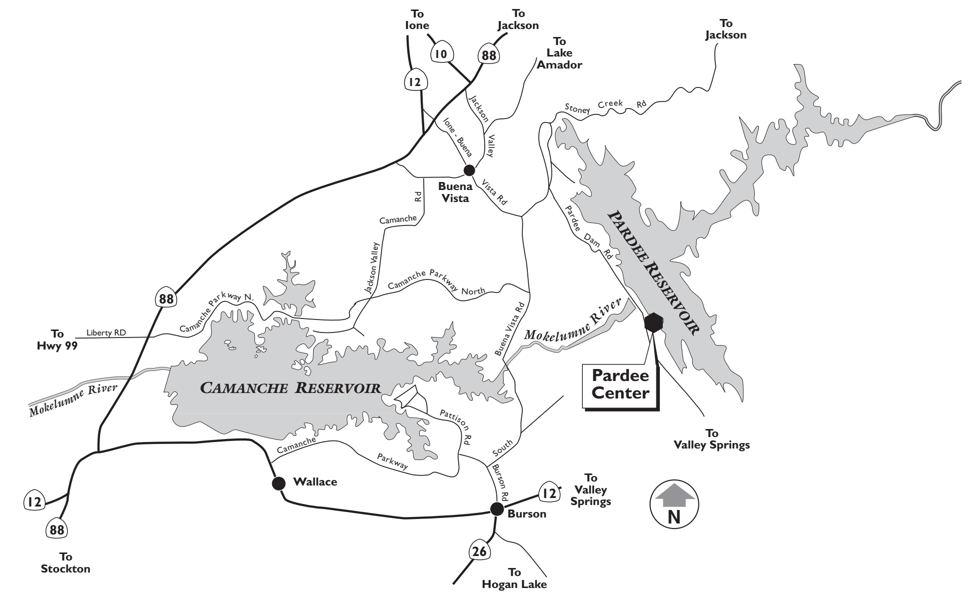
PARDEE CENTER 2003 CONSUMER CONFIDENCE REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call Harold Roberson, Water Treatment/Distribution System Supervisor at 209-772-8368.

The Public Health Security and Bioterrorism Response Act of 2003 requires community water systems to conduct vulnerability assessments and develop/revise Emergency Response Plans. In compliance with the Act, the District has prepared vulnerability assessments of the Mokelumne Area systems. In addition, revision of current Emergency Response Plans is in-progress for completion within the mandated guidelines of the Act. Questions regarding District compliance with the Act should be referred to the Security Section at (510) 287-1327.

Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Pardee Reservoir is the water source for Pardee Center. Pardee Center has a dual water distribution system. The non-potable system serves the fire hydrants, irrigation system, chemical buildings, and various other uses throughout Pardee Center. Pardee Center is served by a state-of-the-art nanofiltration membrane water treatment facility. Nanofiltration can remove particles as small as 0.001 microns. Water treatment also includes the addition of soda ash for corrosion control. The distribution system is served by a 13,900 gallon water storage tank. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Pardee Center water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2003.

In order to ensure that the water is safe to drink, the USEPA and the DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The California Department of Health Services (DHS) requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District reservoir, and found that the source is most vulnerable to boating and marina gas stations. In 2003, no contaminants associated with these activities were detected in EBMUD's drinking water.

The detailed results of this assessment can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton DHS office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public or Maximum Contaminant Level Goals as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Pardee Center WTP does remove cryptosporidium and giardia as their sizes are larger (crypto 3-5 micron, giardia 7-14 micron) than the membrane which is 0.001 micron. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Primary Drinking Water Standards

Contaminants that may be present in the source water include:

Microbiological Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in the system in 2003.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 12 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the DHS).

Lead and copper were last monitored in 2002 at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. Monitoring of radiological contaminants was waived by the DHS.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides, which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. The DHS has waived monitoring of SOCs for Pardee Center.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The latest monitoring in 2003 showed no detection of VOCs including MTBE.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of parameters with secondary MCLs are required by DHS once a year. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated. General minerals and chemicals are monitored once a year as required by the DHS. Samples were taken from treated water.

Pardee Center 2003 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2003 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2003. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Pardee Center 2003 Water Quality Data

Primary Contaminants	MCL	PHG (MCLG)	Average	Range	Typical Sources
Turbidity (NTU)	TT = 1 NTU	NS	0.05	All samples were 0.05	Soil runoff
	TT = 95 percent of samples <0.3 NTU	NS	100%	N/A	

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Organic Contaminants	MCL	PHG (MCLG)	Average	Range	Typical Sources
Trihalomethanes (µg/L)	100	NS	2.8		By-product of drinking water chlorination

Secondary Parameters	MCL	Average	Range	Typical Sources
Chloride (mg/L)	250	2.0	1.3–2.4	Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive		Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Color, color units	15	2		Naturally occurring organic materials
Odor–Threshold (TON)	3	2.8		Naturally occurring organic materials
Specific Conductance (µmho/cm)	1600	39		Substances that form ions when in water; seawater influence
Total Dissolved Solids (mg/L)	1000	32		Runoff/leaching from natural deposits
Turbidity (NTU)	5	0.05		Soil runoff

Other Parameters	Average	Other Parameters	Average
Alkalinity, bicarbonate (mg/L)	17	Potassium (mg/L)	0.4
Calcium (mg/L)	1.8	Silica (mg/L)	9.2
Hardness (mg/L)	18	Sodium (mg/L)	6.5
Magnesium (mg/L)	0.5		

Key

AL = Regulatory Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
N/A = Not Applicable
ND = Not Detected.
NS = No Standards
NTU = Nephelometric Turbidity Units
pCi/L = picoCuries per liter (a measure of radioactivity)
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TON = Threshold Odor Number
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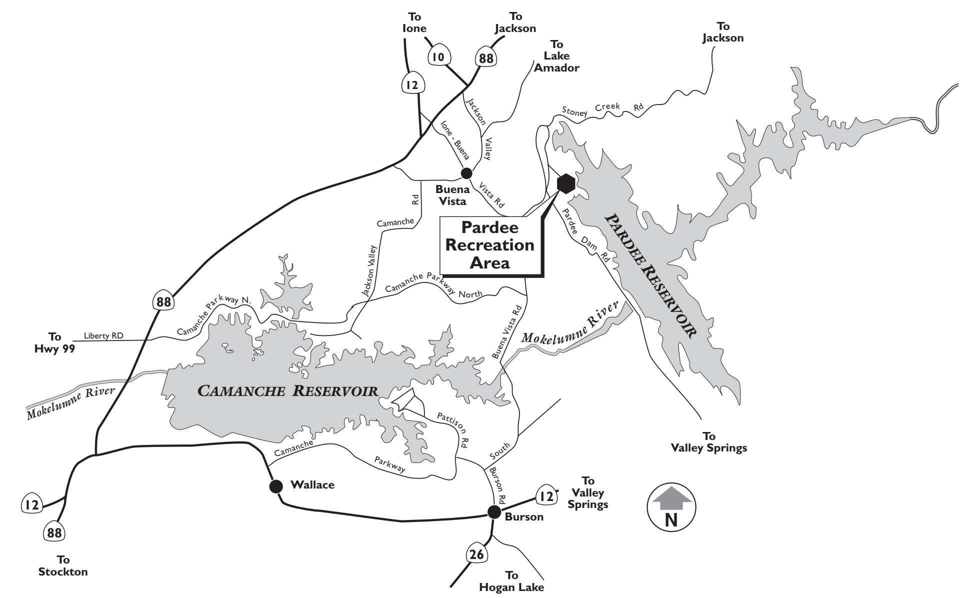
PARDEE RECREATION AREA 2003 CONSUMER CONFIDENCE REPORT



Water System Information

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Water Source and Treatment

Pardee Reservoir is the water source for Pardee Recreation Area. The Recreation Area is served by a state-of-the-art ultrafiltration membrane water treatment facility. Ultrafiltration can remove particles as small as 0.01 microns. The distribution system is served by a 97,000 gallon water storage tank. The water treatment facility and distribution system are operated by state certified water treatment operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (DHS) sets water quality requirements for the Pardee Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2003.

In order to ensure that the water is safe to drink, the USEPA and DHS prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DHS regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The California Department of Health Services (DHS) requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District reservoir, and found that the source is most vulnerable to gas stations. In 2003, no contaminants associated with these activities were detected in EBMUD's drinking water.

The detailed results of this assessment can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton DHS office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public or Maximum Contaminant Level Goals as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

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Primary Drinking Water Standards

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Microbiological Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in the system in 2003.

Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is waived by the DHS except for nitrate (annually) and nitrite (once every three years).

Monitoring was waived by the DHS for Lead and Copper at the consumer taps. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. The DHS has waived radiological monitoring for Pardee Recreation Area.

Synthetic Organic Chemicals (SOCs) including pesticides and herbicides, which may come from a variety of sources such as urban stormwater runoff and agricultural and residential uses. The DHS has waived monitoring of SOCs for Pardee Recreation Area.

Volatile Organic Chemicals (VOCs) are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The DHS has waived monitoring of VOCs for Pardee Recreation Area.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is waived by the DHS.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the DHS to determine where certain contaminants occur and whether the contaminants need to be regulated.

Pardee Recreation Area 2003 Water Quality Data

The table at right lists all the drinking water contaminants that we detected during the 2003 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2003. The DHS requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Pardee Recreation Area 2003 Water Quality Data

Primary Contaminants	MCL	PHG (MCLG)	Average	Range	Typical Sources
Turbidity (NTU)	TT = 1 NTU	NS	0.05	All samples were 0.05	Soil runoff
	TT = 95 percent of samples <0.3 NTU	NS	100%	N/A	

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Organic Contaminants	MCL	PHG (MCLG)	Average	Range	Typical Sources
Trihalomethanes (μg/L)	100	NS	41		By-product of drinking water chlorination

Secondary Parameters	MCL	Average	Typical Sources
Chloride (mg/L)	250	1.7	Runoff/leaching from natural deposits; seawater influence
Corrosivity	Non-corrosive	Non-corrosive	Natural or industrially-influenced balance of hydrogen, carbon and oxygen in the water; affected by temperature and other factors
Specific Conductance (μmho/cm)	1600	36	Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	1.2	Runoff/leaching from natural deposits; industrial wastes
Turbidity (NTU)	5	0.05	Soil runoff

Other Parameters	Level Found	Other Parameters	Level Found
Alkalinity, bicarbonate (mg/L)	13	Potassium (mg/L)	0.6
Calcium (mg/L)	3.3	Silica (mg/L)	8.6
Hardness (mg/L)	14	Sodium (mg/L)	2.0
Magnesium (mg/L)	1.0		

Key

AL = Regulatory Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
N/A = Not Applicable

ND = Not Detected.
NS = No Standards
NTU = Nephelometric Turbidity Units
pCi/L = picoCuries per liter (a measure of radioactivity)

PHG = Public Health Goal
TON = Threshold Odor Number
μg/L = micrograms per liter, or parts per billion (ppb)
μmhos/cm = micro mhos per centimeter (measure of conductivity)

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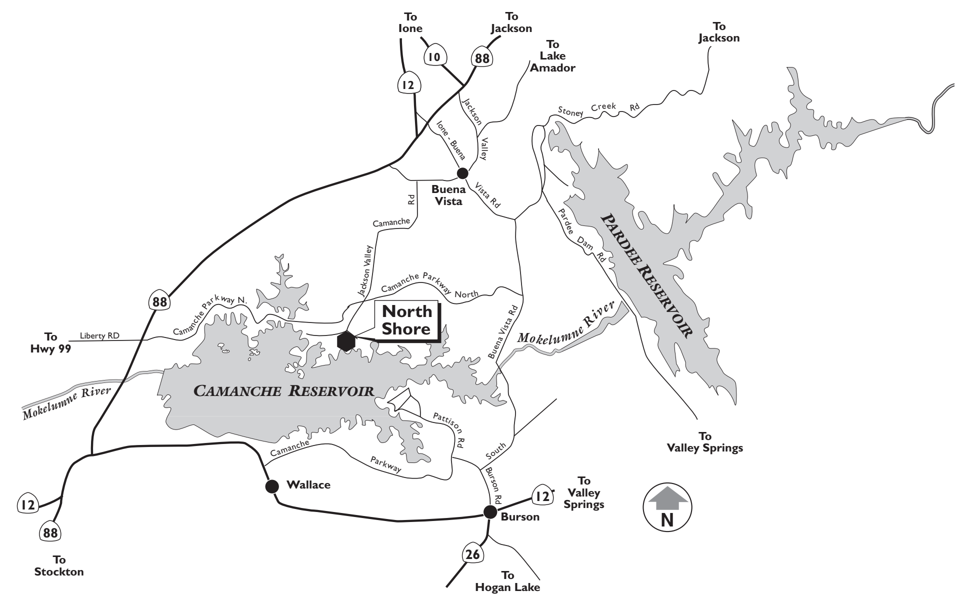
CAMANCHE NORTH SHORE 2004 CONSUMER CONFIDENCE REPORT

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (Department) sets water quality requirements for the Camanche North Shore Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All primary water quality regulations were met in 2004.

In order to ensure that the water is safe to drink, the USEPA and the Department prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that provide the same protection for public health.



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call the Pardee Water/Wastewater Supervisor at 209-772-8368.

The Park Advisory Board meets in March, July and November at Pardee Center to discuss matters relating to water quality. For exact dates and times, please call (209) 772-8203. Public participation is encouraged.

The Public Health Security and Bioterrorism Response Act of 2003 requires community water systems to conduct vulnerability assessments and develop/revise Emergency Response Plans. In compliance with the Act, the District has prepared vulnerability assessments of the Mokelumne Area systems. In addition, revision of current Emergency Response Plans is in-progress for completion within the mandated guidelines of the Act. Questions regarding District compliance with the Act should be referred to the Security Section at (510) 287-1327.

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Three deep wells are the water sources for Camanche North Shore Recreation Area. Water is treated at the Camanche North Shore Water Treatment Plant. Treatment includes: potassium permanganate addition for iron and manganese removal, filtration and chlorination. The older finished water tank was refurbished and placed back in service in 2003. The water treatment facility and distribution system are operated by state certified operators.

Source Water Protection Activities

The Department requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District aquifer, and found that the source is most vulnerable to gas stations. In 2004, no contaminants associated with these activities were detected in EBMUD's drinking water sources.

The detailed results of this assessment completed in 2002 can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton Department office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (EPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Residual Disinfectant Level (MRDL): The level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a disinfectant added for water treatment below which there is no known or expected risk to health. MRDLGs are set by the U.S. Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Contaminants in Drinking Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in the source water include:

Microbial Contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in our system in 2004.

Inorganic Contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming. Sampling for all inorganic chemicals is required once every 36 months except nitrate that is required annually. Nitrate and asbestos were monitored in 2004 and were not detected in our source water. Barium was not detected in the water supplied to consumers.

Lead and copper were monitored in 2004 and the next sampling is scheduled in 2007. Results were below reportable levels at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally-occurring or the result of oil and gas production and mining activities. The most recent radioactive sampling of source water was performed in 2001 and the next round of monitoring is in 2005. Results were within standards.

Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff and residential uses. Atrazine and Simazine will be monitored once every three years after the 2005 monitoring and were not detected during the last monitoring in 2003. The Department waived monitoring requirements for the remaining pesticides and herbicides.

Organic Chemical Contaminants, including synthetic and volatile organic chemicals that are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff and septic systems. Detectable levels of these chemicals well below Department health-related limits (ethylbenzene and xylenes) were found in 2004 due to the rehabilitation of the old water tank. Quarterly monitoring will be done until detectable levels are eliminated at the old water tank.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is required once every 36 months except Thiobencarb which is waived by the Department. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the Department to determine where certain contaminants occur and whether the contaminants need to be regulated. Samples were taken from treated water.

Camanche North Shore 2004 Water Quality Data

The table at right lists all the drinking water contaminants that we detected during the 2004 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. ***Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2004.*** The Department requires us to monitor certain contaminants less than once per year because the concentration of these contaminants is not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Camanche North Shore 2004 Water Quality Data

Primary Contaminants	MCL or [MRDL]	PHG (MCLG) or [MRDLG]	Average	Range	Sample Date	Typical Sources
Inorganic Contaminants						
Barium (mg/L)	1.0	–	0.22	ND–0.49	April '02	Discharge of oil drilling wastes and from metal refineries; erosion of natural deposits
Fluoride (mg/L)	2	1	ND	ND–0.14		Erosion of natural deposits; discharge from fertilizer and aluminum factories
Radioactive Contaminants						
Alpha activity (pCi/L)	15	NS	1.3	ND–6	2001	Erosion of natural deposits
Beta activity (pCi/L)	50	NS	8	6–11	2001	Decay of man-made and natural deposits
Organic Contaminants						
Ethylbenzene (μg/L)	300	300	0.7	<0.5-2		Discharges from petroleum refineries; industrial chemical factories
Xylenes (μg/L)	1750	1800	3.3	1.6–6.9		Discharges from petroleum refineries and chemical factories; fuel solvent
Disinfection Byproducts, Disinfectant Residuals						
Trihalomethanes (μg/L)	80	NS	14			By-product of drinking water chlorination
Haloacetic Acids (5 species) (μg/L)	60	NS	3.7			By-product of drinking water chlorination
Chlorine residual as Cl_2 (mg/L)	[4]	[4]	0.5	1.2†		By-product of drinking water chlorination

†Maximum level found

Secondary Parameters	MCL	Average	Sample Date	Typical Sources
Chloride (mg/L)	500	11		Runoff/leaching from natural deposits; seawater influence
Color, color units	15	6		Naturally occurring organic materials
Odor–Threshold (TON)	3	2.8		Naturally occurring organic materials
Specific Conductance (μmho/cm)	1600	332		Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	36		Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (mg/L)	1000	280		Runoff/leaching from natural deposits
Turbidity (NTU)	5	0.45	April '02	Soil runoff

Unregulated Contaminants	MCLG	Average	Range	Sample Date	Typical Sources
Boron (mg/L)	AL = 1	0.4	0.1–0.9	June '03	Runoff/leaching from natural deposits

Other Parameters	Level Found	Other Parameters	Level Found
Alkalinity, bicarbonate (mg/L)	119	pH (pH units)	7.8
Alkalinity, carbonate (mg/L)	1	Potassium (mg/L)	7.6
Calcium (mg/L)	32.1	Silica (mg/L)	63
Hardness (mg/L)	99	Sodium (mg/L)	28.6
Magnesium (mg/L)	5.5		

Key

AL = Regulatory Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
MRDL = Maximum Residual Disinfectant Level
MRDLG = Maximum Residual Disinfectant Level Goal
ND = Not Detected
NS = No Standards
NTU = Nephelometric Turbidity Units
pCi/L = picoCuries per liter (a measure of radioactivity)
PHG = Public Health Goal
TON = Threshold Odor Number
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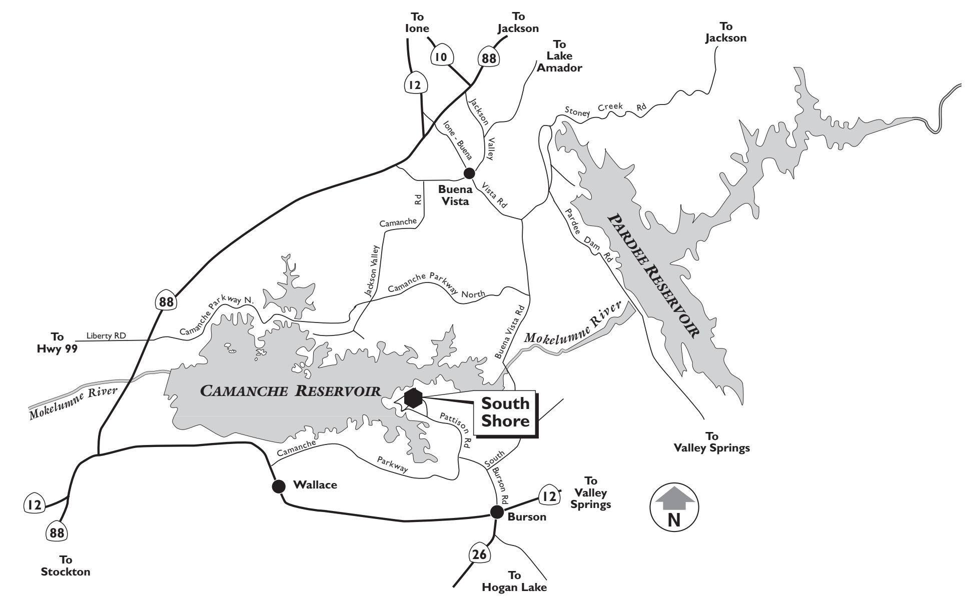
CAMANCHE SOUTH SHORE 2004 CONSUMER CONFIDENCE REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call the Pardee Water/Wastewater Supervisor at 209-772-8368.

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The Public Health Security and Bioterrorism Response Act of 2003 requires community water systems to conduct vulnerability assessments and develop/revise Emergency Response Plans. In compliance with the Act, the District has prepared vulnerability assessments of the Mokelumne Area systems. In addition, revision of current Emergency Response Plans is in-progress for completion within the mandated guidelines of the Act. Questions regarding District compliance with the Act should be referred to the Security Section at (510) 287-1327.

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Water Source and Treatment

Camanche Reservoir is the water source for Camanche South Shore Recreation Area. The Recreation Area is served by Camanche South Shore Water Treatment Plant. Treatment includes: coagulation, filtration and chlorination. The water treatment facility and distribution system are operated by state certified operators. The distribution system is served by two 240,000 gallon storage tanks.

This report describes the results from water sampling for potential contaminants and gives information on water related activities The California Department of Health Services (Department) sets water quality requirements for the Camanche South Shore Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All primary drinking water standards were met in 2004.

In order to ensure that the water is safe to drink, the USEPA and the Department prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The Department requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District reservoir, and found that the source is most vulnerable to the following activities: boating and marina gas stations, wastewater treatment and disposal facilities, historic gas stations, known contaminant plumes and historical mining. In 2004, no contaminants associated with these activities were detected in EBMUD's drinking water.

The detailed results of this assessment completed in 2002 can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton Department office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Residual Disinfectant Level (MRDL): The level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a disinfectant added for water treatment below which there is no known or expected risk to health. MRDLGs are set by the U.S. Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Contaminants in Drinking Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in the source water include:

Microbial Contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in our system in 2004.

Inorganic Contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming. Trace levels of aluminum were found at Camanche Reservoir, but treated water samples showed no aluminum detected.

Sampling for all inorganic chemicals is required once every 12 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the Department).

Lead and copper were monitored in 2004 at consumer taps, as required by the Lead & Copper Rule. Results were within standards. No lead was detected at consumer taps. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. Radiological sampling of source water was performed in 2001 and the next round of sampling will be in 2005. Results were within standards.

Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff and residential uses. The Department waived monitoring requirements for these chemicals, except Simazine and Atrazine that are monitored once every three years.

Organic Chemical Contaminants, including synthetic and volatile organic chemicals that are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications and septic systems. The latest monitoring occurred in 2003 and no detectable levels of these chemicals (including MTBE) were found at the drinking water intake or in the reservoir. The Department granted a one-time 3-year waiver and the next monitoring will be due in 2009.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is required once every 12 months except Thiobencarb which is waived by the Department. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the Department to determine where certain contaminants occur and whether the contaminants need to be regulated. General minerals and chemicals are monitored once a year as required by the Department.

Camanche South Shore 2004 Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2004 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. ***Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2004.*** The Department requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Camanche South Shore 2004 Water Quality Data

Primary Contaminants	MCL or [MRDL]	PHG (MCLG) or [MRDLG]	Average	Range	Typical Sources
Microbial Contaminants					
Turbidity (NTU)*	TT = 5.0 NTU	NS	0.05	0.12†	Soil runoff
	TT = 95% of samples ≤0.5 NTU	NS	100%	100%	

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.
†Maximum level found

Primary Contaminants	MCL or [MRDL]	PHG (MCLG) or [MRDLG]	Average	Range	Typical Sources
Inorganic Contaminants					
Aluminum (mg/L)	1	0.6	0.06		Erosion of natural deposits
Copper (mg/L)	AL = 1.3	0.17	90th percentile = 0.083	No sites above the AL out of 5 sites sampled	Corrosion of household plumbing
Disinfection Byproducts, Disinfectant Residuals					
Trihalomethanes (μg/L)	80	NS	30.5	20–44	By-product of drinking water chlorination
Haloacetic acids, 5 species (μg/L)	60	NS	25.3	12–30	By-product of drinking water chlorination
Chlorine residual as Cl_2 (mg/L)	[4]	[4]	0.7	1.1†	By-product of drinking water chlorination

†Maximum level found

Secondary Parameters	MCL	Average	Violation	Typical Sources
Chloride (mg/L)	500	3.7		Runoff/leaching from natural deposits; seawater influence
Color, color units	15	5		Naturally-occurring organic materials
Odor–Threshold (TON)	3	**5.4***	May 13, 2004	Naturally-occurring organic materials
Specific Conductance (μmho/cm)	1600	51.2		Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	1.9		Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (mg/L)	1000	43		Runoff/leaching from natural deposits

*MCL exceedance for TON did not coincide with any odor complaints or detection by consumers.

Other Parameters	Level Found	Other Parameters	Level Found
Alkalinity, bicarbonate (mg/L)	17.9	pH (pH units)	7.6
Calcium (mg/L)	4.6	Potassium (mg/L)	0.7
Hardness (mg/L)	17	Silica (mg/L)	5.8
Magnesium (mg/L)	1.3	Sodium (mg/L)	2.8

Key

- **AL** = Regulatory Action Level
- **MCL** = Maximum Contaminant Level
- **MCLG** = Maximum Contaminant Level Goal
- **mg/L** = milligrams per liter, or parts per million (ppm)
- **MRDL** = Maximum Residual Disinfectant Level
- **MRDLG** = Maximum Residual Disinfectant Level Goal
- **NS** = No Standards
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- **PHG** = Public Health Goal
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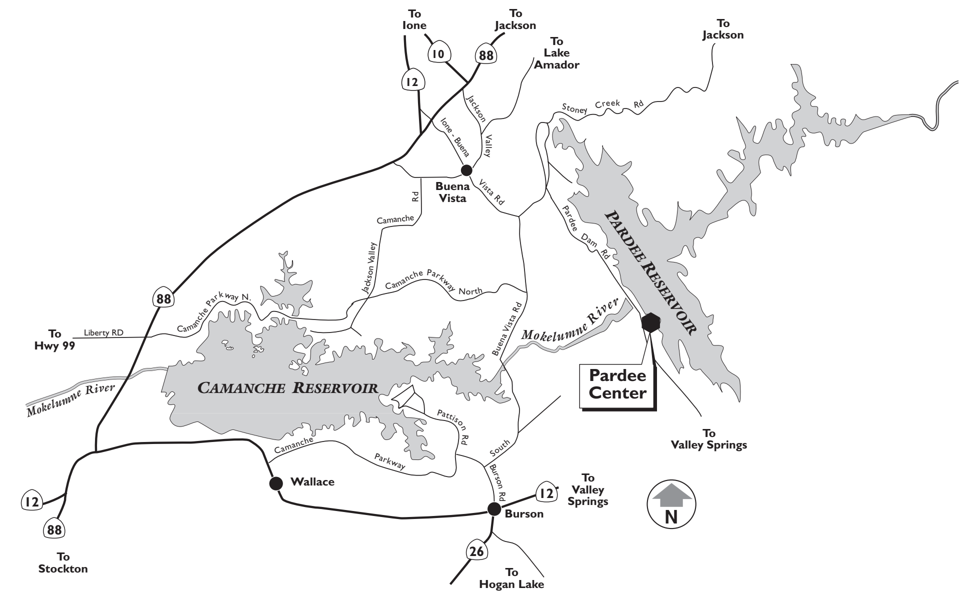
East Bay Municipal Utility District

Pardee Center
2004 Consumer Confidence Report



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Water Source and Treatment

Pardee Reservoir is the water source for Pardee Center. Pardee Center has a dual water distribution system. The non-potable system serves the fire hydrants, irrigation system, chemical buildings, and various other uses throughout Pardee Center. Pardee Center is served by a state-of-the-art nanofiltration membrane water treatment facility. Nanofiltration can remove particles as small as 0.001 microns. Water treatment also includes the addition of soda ash for corrosion control. The distribution system is served by a 13,900 gallon water storage tank. The water treatment facility and distribution system are operated by state certified operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities.

The California Department of Health Services (Department) sets water quality requirements for the Pardee Center water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2004.

In order to ensure that the tap water is safe to drink, the USEPA and the Department prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. The Department regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The Department requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District reservoir, and found that the source is most vulnerable to boating and marina gas stations. In 2004, no contaminants associated with these activities were detected in EBMUD's drinking water.

The detailed results of this assessment completed in 2002 can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton Department office.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

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Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Pardee Center WTP does remove cryptosporidium and giardia as their sizes are larger (crypto 3-5 micron, giardia 7-14 micron) than the membrane which is 0.001 micron. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Contaminants in Drinking Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in the source water include:

Microbial Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. We found no coliform bacteria in the system in 2004.

Inorganic Contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is required once every 12 months, except asbestos (required once every 9 years) and cyanide (requirement waived by the Department).

Lead and copper were last monitored in 2002 and the next round of sampling is in 2005 at consumer taps, as required by the Lead & Copper Rule. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities. Monitoring of radiological contaminants was waived by the Department.

Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff and residential uses. The Department has waived monitoring of these chemicals for Pardee Center.

Organic Chemical Contaminants, including synthetic and volatile organic chemicals that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff and septic systems. The latest monitoring in 2003 showed no detection of these chemicals including MTBE.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of parameters with secondary MCLs are required by Department once a year. Samples were taken from treated water.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the Department to determine where certain contaminants occur and whether the contaminants need to be regulated. General minerals and chemicals are monitored once a year as required by the Department. Samples were taken from treated water.

Pardee Center 2004 Water Quality Data

The table at right lists all the drinking water contaminants that we detected during the 2004 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. ***Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2004.*** The Department requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Pardee Center 2004 Water Quality Data

Primary Contaminants	MCL or [MRDL]	PHG (MCLG) or [MRDLG]	Average	Range	Typical Sources
Microbial Contaminants					
Turbidity (NTU)*	TT = 5 NTU	NS	0.05	All samples were 0.05	Soil runoff
	TT = 95% of samples ≤0.5 NTU	NS	100%	100%	

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Disinfection Byproducts, Disinfectant Residuals	MCL or [MRDL]	PHG (MCLG) or [MRDLG]	Average	Range	Typical Sources
Trihalomethanes (µg/L)	80	NS	17		By-product of drinking water chlorination
Haloacetic acids, 5 species (µg/L)	60	NS	12		By-product of drinking water chlorination
Chlorine residual as Cl_2 (mg/L)	[4]	[4]	0.6	1†	By-product of drinking water chlorination

†Maximum level found

Secondary Parameters	MCL	Average	Typical Sources
Chloride (mg/L)	500	2.0	Runoff/leaching from natural deposits; seawater influence
Color (color units)	15	2	Naturally occurring organic materials
Odor–Threshold (TON)	3	1.9	Naturally occurring organic materials
Specific Conductance (µmho/cm)	1600	59.4	Substances that form ions when in water; seawater influence
Total Dissolved Solids (mg/L)	1000	40	Runoff/leaching from natural deposits

Other Parameters	Average	Other Parameters	Average
Alkalinity, bicarbonate (mg/L)	17.6	pH (pH units)	8.5
Calcium (mg/L)	2.2	Potassium (mg/L)	0.4
Hardness (mg/L)	9	Silica (mg/L)	8.3
Magnesium (mg/L)	0.6	Sodium (mg/L)	5.5

Key

MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
MRDL = Maximum Residual Disinfectant Level
MRDLG = Maximum Residual Disinfectant Level Goal
NS = No Standards
NTU = Nephelometric Turbidity Units
PHG = Public Health Goal
TON = Threshold Odor Number
TT = Treatment Technique
µg/L = micrograms per liter, or parts per billion (ppb)
µmhos/cm = micro mhos per centimeter (measure of conductivity)

EAST BAY
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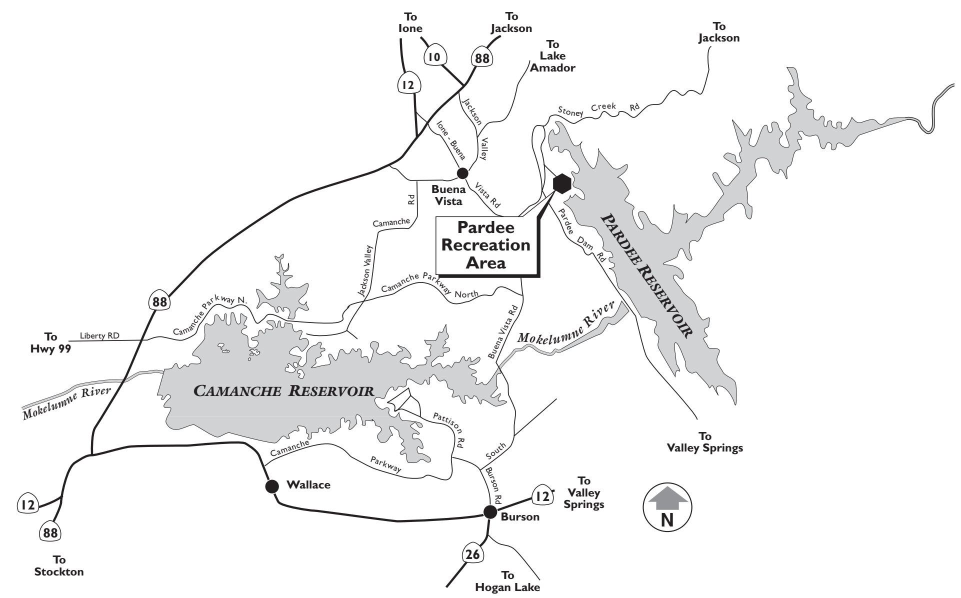
EBMUD

EAST BAY MUNICIPAL UTILITY DISTRICT

PARDEE RECREATION AREA 2004 CONSUMER CONFIDENCE REPORT



Water System Information

This report includes information such as the source water, its water quality and comparisons to State and Federal drinking water standards. For more information, please call the Pardee Water/Wastewater Supervisor at 209-772-8368.

The Public Health Security and Bioterrorism Response Act of 2003 requires community water systems to conduct vulnerability assessments and develop/revise Emergency Response Plans. In compliance with the Act, the District has prepared vulnerability assessments of the Mokelumne Area systems. In addition, revision of current Emergency Response Plans is in-progress for completion within the mandated guidelines of the Act. Questions regarding District compliance with the Act should be referred to the Security Section at (510) 287-1327.

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo ó hable con alguién que lo entienda bien.

Water Source and Treatment

Pardee Reservoir is the water source for Pardee Recreation Area. The Recreation Area is served by a state-of-the-art ultrafiltration membrane water treatment facility. Ultrafiltration can remove particles as small as 0.01 microns. The distribution system is served by a 97,000 gallon water storage tank. The water treatment facility and distribution system are operated by state certified operators.

This report describes the results from water sampling for potential contaminants and gives information on water related activities. The California Department of Health Services (Department) sets water quality requirements for the Pardee Recreation Area water system, in order to ensure that the water is safe to drink. Complying with regulations requires an extensive monitoring program in both the source and treated waters. All water quality regulations were met in 2004.

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Residual Disinfectant Level (MRDL): The level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a disinfectant added for water treatment below which there is no known or expected risk to health. MRDLGs are set by the U.S. Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Educational Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants

In order to ensure that the water is safe to drink, the USEPA and the Department prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Source Water Protection Activities

The Department requires water utilities to determine the types of activities that can pollute their drinking water sources. EBMUD evaluated more than 100 activities that take place near this District reservoir, and found that the source is most vulnerable to gasoline storage and dispensing at the recreation area marina and boating. In 2004, no contaminants associated with these activities were detected in EBMUD's drinking water.

The detailed results of this assessment completed in 2002 can be reviewed at the District's headquarters at Pardee Center, northeast of Valley Springs or at the Stockton Department office.

and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes cryptosporidium, the most commonly used filtration methods cannot guarantee 100 percent removal. Pardee Recreation WTP does remove cryptosporidium and giardia as their sizes are larger (crypto 3-5 micron, giardia 7-14 micron) than the membrane which is 0.01 micron. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Contaminants in Drinking Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in the source water include:

Microbial Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Treatment Techniques (TT) are used to ensure disinfection and inactivation of coliforms and waterborne pathogens. These include: turbidity removal and sufficient disinfectant residual concentrations and time of contact. We found no coliform bacteria in the system in 2004.

Inorganic Contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Sampling for all inorganic chemicals is waived by the Department except for nitrate (annually) and nitrite (once every three years).

Monitoring was waived by the Department for Lead and Copper at the consumer taps. Private plumbing and fixtures may add lead or copper levels above the level delivered by the District. Hot water systems can contain elevated levels of lead and copper so it is not advisable to drink from hot water faucets. Selection of faucets and plumbing materials should be based on the use of approved materials for potable consumption and installed according to local building codes.

Radioactive Contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. The Department has waived radiological monitoring for Pardee Recreation Area.

Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff and residential uses. The Department has waived monitoring of these chemicals for Pardee Recreation Area.

Organic Chemical Contaminants, including synthetic and volatile organic chemicals, that are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff and septic systems. The Department has waived monitoring of these chemicals for Pardee Recreation Area.

Secondary Parameters include aesthetic qualities such as taste and odor and appearance. The clarity of the water can be measured by color, turbidity and aluminum content. Monitoring of secondary standards is waived by the Department.

Other Parameters include unregulated contaminants and general minerals and chemicals. Unregulated contaminant monitoring helps the EPA and the Department to determine where certain contaminants occur and whether the contaminants need to be regulated.

Pardee Recreation Area 2004 Water Quality Data

The table at right lists all the drinking water contaminants that we detected during the 2004 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. ***Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2004.*** The Department requires us to monitor certain contaminants less than once per year because the concentration of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Pardee Recreation Area 2004 Water Quality Data

Primary Contaminants	MCL or [MRDL]	PHG (MCLG) or [MRDLG]	Average	Range	Sample Date	Typical Sources
Microbial Contaminants						
Turbidity (NTU)*	TT = 5 NTU	NS	0.05	All samples were 0.05		Soil runoff
	TT = 95% of samples ≤0.5 NTU	NS	100%	100%		

*Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Disinfection Byproducts, Disinfectant Residuals	MCL or [MRDL]	PHG (MCLG) or [MRDLG]	Average	Range	Sample Date	Typical Sources
Trihalomethanes (µg/L)	80	NS	41		March '03	By-product of drinking water chlorination
Haloacetic acids, 5 species (µg/L)	60	NS	26		March '03	By-product of drinking water chlorination
Chlorine Residual as Cl_2 (mg/L)	[4]	[4]	0.6	0.9†		By-product of drinking water chlorination

†Maximum level found

Secondary Parameters	MCL	Average	Typical Sources
Chloride (mg/L)	500	4	Runoff/leaching from natural deposits; seawater influence
Specific Conductance (µmho/cm)	1600	45.8	Substances that form ions when in water; seawater influence
Sulfate (mg/L)	500	1.3	Runoff/leaching from natural deposits; industrial wastes

Other Parameters	Level Found	Other Parameters	Level Found
Alkalinity, bicarbonate (mg/L)	15.9	pH (pH units)	7.6
Calcium (mg/L)	3.4	Potassium (mg/L)	0.6
Hardness (mg/L)	13	Silica (mg/L)	9.7
Magnesium (mg/L)	1.0	Sodium (mg/L)	3.8

Key

MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
mg/L = milligrams per liter, or parts per million (ppm)
MRDL = Maximum Residual Disinfectant Level
MRDLG = Maximum Residual Disinfectant Level Goal
NS = No Standards
NTU = Nephelometric Turbidity Units
PHG = Public Health Goal
TT = Treatment Technique
µg/L = micrograms per liter, or parts per billion (ppb)
µmhos/cm = micro mhos per centimeter (measure of conductivity)

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Appendix C-1 Hazardous Materials Inventory -Pardee Reservoir Recreation Area

There are no acutely hazardous materials stored and/or handled at the Pardee Reservoir Recreation Area. The hazardous materials stored and/or handled at the facility in quantities above the Federal SARA Title III and California Hazardous Materials Release Response and Inventory Program specified quantities are identified below. More detailed descriptions of chemical properties, how the materials are used, and where they are located are provided in the attached county forms.

CAS #	Chemical Name	DOT #	Form	Type	Max Qty	Ave Qty	Container
68334-30-5	diesel fuel	1993	liquid	mixture	55 gal	23 gal	steel drum
68334-30-5	odortrol	1993	liquid	mixture	300 gal	150 gal	abvgrnd tank
74-98-6	propane	1075	liquid	pure	1,500 gal	750 gal	abvgrnd tanks
7681-52-9	sodium hypochlorite	1791	liquid	mixture	215 gal	110 gal	plastic carboy
8006-61-9	unleaded gasoline	1203	liquid	mixture	2,000 gal	1,000 gal	undergrnd tank*
8006-61-9	unleaded gasoline	1203	liquid	mixture	2,000 gal	1,000 gal	undergrnd tank*
8006-61-9	outboard gasoline (two-cycle lube oil & unleaded gas)	1993	liquid	mixture	2,000 gal	1,550 gal	undergrnd tank

* *These two tanks are in the process of being replaced with two 2,000 gallon aboveground tanks.*

In addition to the hazardous materials identified above, the following table identifies other materials stored and/or handled at the Pardee Reservoir Recreation Area that may contain hazardous components. All of the materials identified in the following table are stored and/or handled in quantities <u>below</u> the specified reporting quantities required for official inclusion in the hazardous materials business plan; however, since they may contain hazardous components, they may still be of concern to emergency responders.

Appendix C-2 Hazardous Materials Inventory -Pardee Center

Hazardous materials stored and/or handled at Pardee Center in quantities above the Federal SARA Title III and California Hazardous Materials Release Response and Inventory Program specified quantities are identified below. A more detailed description of chemical properties, how the materials are used, and where they are located are provided in the attached hazardous materials inventory forms.

CAS #	Chemical Name	DOT#	Form	Type	Max Qty	Ave Qty	Container
7778-54-3	calcium hypochlorite	2880	Powder	mixture	250 lbs	175 lbs	plastic bucket
7681-52-9	sodium hypochlorite	1791	Liquid	mixture	30,000 gal	7,500 gal	abvgrnd tank
1305-78-8	lime	1910	Powder	mixture	150,000 lbs	115,000 lbs	silo
8006-61-9	unleaded gasoline	1202	Liquid	mixture	2000 gal	1250 gal	abvgrnd tank
74-98-6	propane	1978	Gas	pure	700 gal	400 gal	abvgrnd tank
8002-05-9	diesel fuel	1993	Liquid	mixture	500 gal	350 gal	abvgrnd tank
N/A	compressed air	1002	Gas	pure	1400 CF	800 CF	cylinder
353-59-3	bromochlorodifluro-methane	1974	Gas	pure	244 lbs	244 lbs	cylinder
7440-37-1	argon	1006	Gas	pure	900 CF	600 CF	cylinder
124-38-9	carbon dioxide	1013	Gas	pure	1200 CF	900 CF	cylinder
74-86-2	acetylene	1001	gas	pure	500 CF	325 CF	cylinder
7782-44-7	oxygen	1072	Gas	pure	1200 CF	600 CF	cylinder
7727-37-9	nitrogen	1066	gas	pure	3000 CF	2400 CF	cylinder
N/A	gear lube SAE 80-90	1270	solid	mixture	120 lbs	70 lbs	steel drum
1310-73-2	sodium hydroxide	1823	powder	pure	400 lbs	100 lbs	steel drum
N/A	poly grease	1270	solid	mixture	150 lbs	100 lbs	steel drum
68476-30-2	30W motor oil	1270	liquid	mixture	120 gal	80 gal	steel drum
Various	caustic soda solution	1824	liquid	mixture	100 gal	50 gal	abvgrnd tank

Note: In addition to the materials identified above, there are other hazardous materials stored or handled onsite (e.g., cleaners, spray paints), but these are stored or handled in quantities that are less than the reporting quantities. Also, portions of the chemical building (e.g., the interior heater walls, chlorine storage room, and chlorinator room) have been identified as containing asbestos.

Appendix C-3 Hazardous Materials Inventory -Camanche North Shore Recreation Area

Hazardous materials stored and/or handled at Camanche North Shore Recreation Area in quantities above the California Hazardous Materials Release Response and Inventory Program specified quantities are identified below. More detailed descriptions of chemical properties, how the materials are used, and where they are located are provided in the attached hazardous materials inventory forms.

CAS #	Chemical Name	DOT#	Form	Type	Max Qty	Ave Qty	Container
74-86-2	acetylene	1001	gas	pure	504 CF	378 CF	Cylinder
68334-30-5	diesel fuel	1993	liquid	mixture	250 gal	200 gal	aboveground tank
7782-44-7	oxygen	1072	gas	pure	896 CF	614 CF	Cylinder
74-98-6	propane	1075	liquid	pure	18,640 gal	9,446 gal	aboveground tanks
8006-61-9	unleaded gasoline	1203	liquid	mixture	6,500 gal	3,250 gal	aboveground tank
7722-64-7	potassium permanganate	1490	solid	pure	220 lbs	140 lbs	Container
772-64-7	potassium permanganate	1490	liquid	mixture	200 gal	140 gal	aboveground tank
7681-52-9	sodium hypochlorite	1791	liquid	mixture	150 gal	65 gal	plastic bottle
1313-13-9	Manganese Dioxide	1479	Solid	pure	8000 lbs	8000 lbs	Bags
64742-65-0	lubricating oil	1993	liquid	mixture	250 gal	200 gal	1 quart container

Appendix C-4 Hazardous Materials Inventory -Camanche South Shore Recreation Area

. Hazardous materials stored and/or handled at Camanche South Shore Recreation Area in quantities above the California Hazardous Materials Release Response and Inventory Program specified quantities are identified below. More detailed descriptions of chemical properties, how the materials are used, and where they are located are provided in the attached hazardous materials inventory forms.

CAS #	Chemical Name	DOT#	Form	Type	Max Qty	Ave Qty	Container
74-86-2	acetylene	1001	gas	pure	504 CF	378 CF	cylinder
68334-30-5	diesel fuel	1993	liquid	mixture	250 gal	200 gal	aboveground tank
7782-44-7	oxygen	1072	gas	pure	896 CF	614 CF	cylinder
74-98-6	propane	1075	liquid	pure	18,640 gal	9,446 gal	aboveground tanks
8006-61-9	unleaded gasoline	1203	liquid	mixture	11,000 gal	8,000 gal	aboveground tank
7778-54-3	Calcium Hypoclorite		solid	mixture	100 Lbs	50 Lbs	plastic bucket
64742-65-0	lubricating oil	1993	liquid	mixture	250 gal	200 gal	1 quart container
WC221	Waste oil		liquid	Mixture	55 gal	20 gal	Steel drum

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Appendix D-1: Pardee Recreation Area Wastewater Treatment Plant
Waste Discharge Requirements Order No. R5-01-270

Influent Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Flow	Gpd	Continuous Meter	Continuous	Monthly	Average Dry Weather flow of 11,500 gpd
BOD_5	mg/L	Grab	Quarterly	Quarterly	--

Effluent Monitoring[1]					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Total Coliform Organisms[2]	MPN/100 ml	Grab	Weekly	Monthly	Daily Max: 240 / Monthly Median: 23
Total Settleable Solids	ml/L	Grab	Weekly	Monthly	Daily Max: 0.5 / Monthly Avg: 0.2
pH	Standard	Grab	Monthly	Monthly	Not < 6.5 or > 8.5
BOD_5[2]	mg/L	Grab	Monthly	Monthly	Daily Max: 40 / Monthly Avg: 20
Total Dissolved Solids	mg/L	Grab	Monthly	Monthly	--
Nitrate as Nitrogen	mg/L	Grab	Monthly	Monthly	--
Total Kjeldahl Nitrogen	mg/L	Grab	Monthly	Monthly	--
Formaldehyde	mg/L	Grab	Monthly, May-September	Monthly, May-September	--
Zinc	mg/L	Grab	Monthly, May-September	Monthly, May-September	--
Phenol	mg/L	Grab	Monthly, May-September	Monthly, May-September	
Standard Minerals[3]	mg/L	Grab	Annually	Annually	--

[1] Effluent Monitoring required only when effluent will be discharged to the spray field. Spraying prohibited from October 1 through April 1.
[2] Limit applies when effluent is discharged to the spray disposal field.

[3] Standard Minerals shall include, at a minimum, barium, calcium, magnesium, sodium, postassium, chloride, sulfate, total alkalinity (including alkalinity series), and hardness.

Lagoon Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Dissolved Oxygen	mg/L	Grab	Weekly	Monthly	Not < 1.0 mg/L
pH	Standard	Grab	Weekly	Monthly	Not < 6.5 or > 9.0
Freeboard	0.25 feet	Measurement	Weekly	Monthly	Not < 2 feet
Odors	--	Observation	Weekly	Monthly	--

Land Application Area Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Flow	Gallons	Continuous	Daily	Monthly	--
Rainfall	Inches	Measurement	Daily	Monthly	--
Acreage Applied (identify the fields)	Acreage	Calcluated	Daily	Monthly	--
Application Rate for each disposal field	Gal/acre-day	Calculated	Daily	Monthly	--
BOD Loading	Lbs/acre-day	Calculated	Monthly	Monthly	--
Total Nitrogen loading rate for each field	Lbs/ac/month	Calculated	Monthly	Monthly	--
Total Dissolved Solids loading rate for each field	Lbs/ac/month	Calculated	Monthly	Monthly	--
Field observations	--	Observation	Each day spraying occurs	Monthly	--

Lysimeter Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Presence of water in lysimeters	--	Observation	Quarterly	Quarterly	--
pH	Standard	Grab	Quarterly	Quarterly	--
Total Dissolved Solids	mg/L	Grab	Quarterly	Quarterly	--
Nitrate as Nitrogen	mg/L	Grab	Quarterly	Quarterly	--
Standard Minerals	mg/L	Grab	Annually	Annually	--

Groundwater Monitoring[1]					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Background Quality Value
Depth to Groundwater	0.01 feet	Measurement	Quarterly	Quarterly	--
Groundwater Elevation	0.01 feet	Calculated	Quarterly	Quarterly	--
Gradient	feet/feet	Calculated	Quarterly	Quarterly	--
Gradient Direction	degrees	Calculated	Quarterly	Quarterly	--
Total Coliform Organisms	MPN/ 100 mL	Grab	Quarterly	Quarterly	--
Total Dissolved Solids	mg/L	Grab	Quarterly	Quarterly	450
Total Kjeldahl Nitrogen	mg/L	Grab	Quarterly	Quarterly	--
pH	Standard	Grab	Quarterly	Quarterly	Not < 6.5 or > 8.5
Total Phenols	mg/l	Grab	Quarterly	Quarterly	--
Formaldehyde	mg/l	Grab	Quarterly	Quarterly	--
Trihalomethanes[2]	µg/L	Grab	Quarterly	Quarterly	Bromoform: 4 / Bromodichloromethane: 0.27 / Chloroform: 1.1 / Dibromochloromethane: 0.37
Boron	mg/L	Grab	Quarterly	Quarterly	0.7
Chloride	mg/L	Grab	Quarterly	Quarterly	106
Iron	mg/L	Grab	Quarterly	Quarterly	0.3
Manganese	mg/L	Grab	Quarterly	Quarterly	0.05
Sodium	mg/L	Grab	Quarterly	Quarterly	69
Standard Minerals	mg/L	Grab	Annually	Annually	--

Water Supply Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
TDS	mg/L	Grab	Annually	Annually	--
pH	Standard	Grab	Annually	Annually	--
Standard Minerals	mg/L	Grab	Annually	Annually	--

Solid Waste and Sludge Monitoring
A log shall be kept of solid waste and sludge quantities generated and of handling and disposal activities, and shall be submitted as part of the annual report.

Discharge Prohibitions

- Discharge of wastes to surface waters or surface water drainage courses is prohibited.
- Bypass or overflow of untreated or partially treated waste is prohibited.
- Discharge of sewage from sanitary sewer system at any point upstream of the WWTP is prohibited. Discharge of treated wastewater downstream of the treatment plant, other than at the spray disposal field, is prohibited.
- Discharge of hazardous waste is prohibited.
- Surfacing of wastewater outside or downgradient of the evaporation/percolation pond is prohibited.
- Use of the land application area as grazing pasture is prohibited.

Discharge Specifications

- No waste constituent shall be released or discharged, or placed where it will be released or discharged, in a concentration or in a mass that causes violation of the Groundwater Limitations.
- Neither the treatment no the discharge shall cause a nuisance or condition of pollution.
- Objectionable odor originating at the facility shall not be perceivable beyond the limits of the wastewater treatment and disposal areas.
- Public contact with wastewater shall be precluded or controlled through such means as fences and signs, or acceptable alternatives.
- The WWTP shall be operated to maximize treatment of wastewater and optimize the quality of the discharge.
- The wastewater treatment, storage, and disposal system shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.
- The facility shall have sufficient treatment, storage, and disposal capacity to accommodate allowable wastewater flow, design seasonal precipitation, and ancillary infiltration and inflow during the winter months. Design seasonal precipitation shall be based on total annual precipitation using a return period of 100 years, distributed monthly in accordance with historical rainfall patterns.
- The wastewater pond shall be managed to prevent the breeding of mosquitoes.

Reporting Requirements

- Monthly report is due by the 1st day of the second month following the end of the reporting period.
- Quarterly report is due by the 1st day of the second month after the quarter.
- Reports are signed by the Manager of Water Supply.
- For monthly reports, submit monitoring results, without the lab reports, and an instrument calibration log, and explain whether wastewater was discharged to the spray disposal field during that month or any of the limitations were violated.
- For quarterly reports, submit monitoring results, report groundwater elevations, calculate groundwater flow gradient, compare monitoring results to applicable limitations, and generate a groundwater elevation contour map.
- Annual report to be submitted by February 1st that provides summary of monitoring data obtained the previous year, and any discussion of corrective actions taken or planned to keep discharge in compliance.

Term of Permit

No permit expiration date.

Appendix D-2: Pardee Center Wastewater Treatment Plant
Waste Discharge Requirements Order No. R5-2003-0119

Influent Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Flow	gpd	Continuous Meter	Daily	Monthly	Monthly average of 2,000 gpd
BOD_5	mg/L	Grab	Monthly	Monthly	--

Effluent Monitoring[3]					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Total Coliform Organisms[1]	MPN/100 ml	Grab	Weekly	Monthly	Daily Max: 240 / Monthly Median: 23
pH	Standard	Grab	Monthly	Monthly	Not < 6.5 or > 8.5
BOD_5	mg/L	Grab	Monthly	Monthly	Daily Max: 40 / Monthly Avg: 20
Total Dissolved Solids	mg/L	Grab	Quarterly	Quarterly	--
Sodium	mg/L	Grab	Quarterly	Quarterly	--
Chloride	mg/L	Grab	Quarterly	Quarterly	--
Nitrate as Nitrogen	mg/L	Grab	Quarterly	Quarterly	--
Total Kjeldahl Nitrogen	mg/L	Grab	Quarterly	Quarterly	--
Standard Minerals[2]	mg/L	Grab	Annually	Annually	--

[1] Applies when effluent is discharged to the spray disposal field. Currently, the spray disposal is NOT occurring.

[2] Standard Minerals shall include, at a minimum, boron, calcium, magnesium, potassium, sulfate, total alkalinity (including alkalinity series), and hardness.

[3] Although not monitored for, limitations for Total Settleable Solids do exist. Daily Max: 1.0 mg/L / Monthly Avg: 0.5 mg/L.

Evaporation/Percolation Pond Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Dissolved Oxygen	mg/L	Grab	Weekly	Monthly	Not < 1.0 mg/L in the upper zone (1 foot)
Freeboard	0.1 feet	Measurement	Weekly	Monthly	Not < 2 feet

Evaporation/Percolation Pond Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Odors	--	Observation	Weekly	Monthly	--
Levee condition	--	Observation	Weekly	Monthly	--

Groundwater Monitoring[1]					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Depth to Groundwater	0.01 feet	Measurement	Quarterly	Quarterly	--
Groundwater Elevation	0.01 feet	Calculated	Quarterly	Quarterly	--
Gradient	feet/feet	Calculated	Quarterly	Quarterly	--
Gradient Direction	degrees	Calculated	Quarterly	Quarterly	--
Total Dissolved Solids	mg/L	Grab	Quarterly	Quarterly	450
Nitrate as Nitrogen	mg/L	Grab	Quarterly	Quarterly	10
Total Kjeldahl Nitrogen	mg/L	Grab	Quarterly	Quarterly	--
pH	Standard	Grab	Quarterly	Quarterly	Not < 6.5 or > 8.5
Trihalomethanes[2]	µg/L	Grab	Quarterly	Quarterly	Bromoform: 4 / Bromodichloromethane: 0.27 / Chloroform: 1.1 / Dibromochloromethane: 0.37
Boron	mg/L	Grab	Quarterly	Quarterly	0.7
Chloride	mg/L	Grab	Quarterly	Quarterly	106
Iron	mg/L	Grab	Quarterly	Quarterly	0.3
Manganese	mg/L	Grab	Quarterly	Quarterly	0.05
Sodium	mg/L	Grab	Quarterly	Quarterly	69
Standard Minerals	mg/L	Grab	Annually	Annually	--

[1] Other constituents with groundwater standards but not required as part of the monitoring program include: Total Coliform Organisms (nondetect); Total Nitrogen (10 mg/L); Nitrite as Nitrogen (1 mg/L); and Ammonia (0.5 mg/L).
[2] Samples shall be collected only from spray disposal field wells. Since no spraying is occurring, no sampling is required.

Water Supply Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
TDS	mg/L	Grab	Annually	Annually	--
pH	Standard	Grab	Annually	Annually	--
Standard Minerals	mg/L	Grab	Annually	Annually	--

Spray Disposal Area Monitoring
None required unless spray disposal occurs.

Solid Waste and Sludge Monitoring
A log shall be kept of solid waste and sludge quantities generated and of handling and disposal activities, and shall be submitted as part of the monthly monitoring reports.

Discharge Prohibitions

- Discharge of wastes to surface waters or surface water drainage courses is prohibited.
- Bypass or overflow of untreated or partially treated waste is prohibited.
- Discharge of sewage from sanitary sewer system at any point upstream of the WWTP is prohibited. Discharge of treated wastewater downstream of the treatment plant, other than at the approved evaporation percolation pond or spray disposal field, is prohibited.
- Discharge of effluent to the spray disposal field is prohibited until the Executive Officer of the RWQCB approves the report required by Provision No. G.1.e of the Order.
- Discharge of hazardous waste is prohibited.
- Surfacing of wastewater outside or downgradient of the evaporation/percolation pond is prohibited.
- The discharge of any wastewater other than that from domestic sources or domestic equivalent is prohibited.

Discharge Specifications

- No waste constituent shall be released or discharged, or placed where it will be released or discharged, in a concentration or in a mass that causes violation of the Groundwater Limitations.
- Neither the treatment no the discharge shall cause a nuisance or condition of pollution.
- Objectionable odor originating at the facility shall not be perceivable beyond the limits of the wastewater treatment and disposal areas.
- Public contact with wastewater shall be precluded or controlled through such means as fences and signs, or acceptable alternatives.
- The WWTP shall be operated to maximize treatment of wastewater and optimize the quality of the discharge.
- The wastewater treatment, storage, and disposal system shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.
- The facility shall have sufficient treatment, storage, and disposal capacity to accommodate allowable wastewater flow, design seasonal precipitation, and ancillary infiltration and inflow during the winter months. Design seasonal precipitation shall be based on total annual precipitation using a return period of 100 years, distributed monthly in accordance with historical rainfall patterns.
- The wastewater pond shall be managed to prevent the breeding of mosquitoes.

Reporting Requirements

- Monthly report is due by the 1st day of the second month following the end of the reporting period.
- Quarterly report is due by the 1st day of the second month after the quarter.
- Reports are signed by Pat Lydon.
- For monthly reports, submit monitoring results, without the lab reports, and an instrument calibration log, and explain whether wastewater was discharged to the spray disposal field during that month or any of the limitations were violated.
- For quarterly reports, submit monitoring results, report groundwater elevations, calculate groundwater flow gradient, compare monitoring results to applicable limitations, and generate a groundwater elevation contour map.
- Annual report to be submitted by February 1st that provides summary of monitoring data obtained the previous year, and any discussion of corrective actions taken or planned to keep discharge in compliance.

Term of Permit

The permit expires in July 2008.

Appendix D-3: Camanche South Shore Wastewater Treatment Plant
Waste Discharge Requirements Order No. R5-2002-0070

Influent Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Total Flow	Gpd	Meter	Continuously	Monthly	--
BOD_5	mg/L	Grab	Quarterly	Quarterly	--

Pond Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Dissolved Oxygen	mg/L	Grab	Weekly	Monthly	Not < 1.0 mg/L
pH	Standard	Grab	Weekly	Monthly	Not < 6.5 or > 9.0
Freeboard	0.25 feet	Measurement	Weekly	Monthly	Not < 2 feet
Berm Seepage	--	Observation	Weekly	Monthly	--
Odors	--	Observation	Weekly	Monthly	--

Effluent Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
BOD_5	mg/L	Grab	Monthly	Monthly	Daily Max: 80 / Monthly Avg: 40
Total Coliform Organisms	MPN/100 ml	Grab	Monthly	Monthly	--
Settleable Solids	ml/L	Grab	Monthly	Monthly	--
Total Dissolved Solids	mg/L	Grab	Monthly	Monthly	--
Nitrate as Nitrogen	mg/L	Grab	Monthly	Monthly	--
Total Kjeldahl Nitrogen	mg/L	Grab	Monthly	Monthly	--
Formaldehyde	mg/L	Grab	Monthly	Monthly	--
Zinc	mg/L	Grab	Monthly	Monthly	--
Phenol	mg/L	Grab	Monthly	Monthly	--
Standard Minerals[1]	mg/L	Grab	Annually	Annually	--

[1] Standard Minerals shall include, at a minimum, Barium, Calcium, Magnesium, Sodium, Potassium, Chloride, Sulfate, Total Alkalinity (including alkalinity series), and Hardness.

Groundwater Monitoring[1]					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Depth to Groundwater	0.01 feet	Measurement	Quarterly	Quarterly	--
Groundwater Elevation	0.01 feet	Measurement	Quarterly	Quarterly	--
Gradient	feet/feet	Calculated	Quarterly	Quarterly	--
Gradient Direction	degrees	Calculated	Quarterly	Quarterly	--
Total Coliform Organisms	MPN/100 ml	Grab	Quarterly	Quarterly	Nondetect
Total Dissolved Solids	mg/L	Grab	Quarterly	Quarterly	450
Nitrate as Nitrogen	mg/L	Grab	Quarterly	Quarterly	10
Total Kjeldahl Nitrogen	mg/L	Grab	Quarterly	Quarterly	--
pH	Standard	Grab	Quarterly	Quarterly	Not < 6.5 or > 8.5
Boron	mg/L	Grab	Quarterly	Quarterly	0.6
Chloride	mg/L	Grab	Quarterly	Quarterly	106
Iron	mg/L	Grab	Quarterly	Quarterly	0.3
Manganese	mg/L	Grab	Quarterly	Quarterly	0.05
Sodium	mg/L	Grab	Quarterly	Quarterly	69
Zinc	mg/L	Grab	Quarterly	Quarterly	--
Total Phenols	mg/L	Grab	Quarterly	Quarterly	--
Formaldehyde	mg/L	Grab	Quarterly	Quarterly	--
Standard Minerals	mg/L	Grab	Annually	Annually	--

[1] Other constituents with groundwater standards but not required as part of the monitoring program include: Total Nitrogen (10 mg/L); Nitrite as Nitrogen (1 mg/L); and Ammonia (0.5 mg/L).

Water Supply Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Electrical Conductivity	µmhos/cm	Grab	Annually	Annually	--
pH	Standard	Grab	Annually	Annually	--
Standard Minerals	mg/L	Grab	Annually	Annually	--

Surface Water Monitoring

Monthly monitoring of the freshwater recreation ponds shall be conducted according to a submitted workplan approved by the RWQCB. The results are submitted along with the quarterly groundwater reports.

Sludge Monitoring

A composite sample of sludge shall be collected when removed from the treatment and storage/disposal ponds, and tested for: Cadmium, Copper, Nickel, Chromium, Lead, and Zinc. Sampling records shall be retained for a minimum of five years. A log shall be kept of sludge quantities generated and of handling and disposal activities.

Discharge Prohibitions

- Discharge of wastes to surface waters or surface water drainage courses is prohibited.
- Bypass or overflow of untreated or partially treated waste is prohibited.
- Discharge of sewage from sanitary sewer system at any point upstream of the WWTP is prohibited.
- Discharge of hazardous waste is prohibited.
- Surfacing of wastewater outside or downgradient of the ponds is prohibited.
- The discharge of any wastewater other than that from domestic sources or domestic equivalent is prohibited.

Discharge Specifications

- No waste constituent shall be released or discharged, or placed where it will be released or discharged, in a concentration or in a mass that causes violation of the Groundwater Limitations.
- Neither the treatment no the discharge shall cause a nuisance or condition of pollution.
- Objectionable odor originating at the facility shall not be perceivable beyond the limits of the wastewater treatment and disposal areas.
- Public contact with wastewater shall be precluded or controlled through such means as fences and signs, or acceptable alternatives.
- The WWTP shall be operated to maximize treatment of wastewater and optimize the quality of the discharge.
- The wastewater treatment, storage, and disposal system shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.
- The facility shall have sufficient treatment, storage, and disposal capacity to accommodate allowable wastewater flow, design seasonal precipitation, and ancillary infiltration and inflow during the winter months. Design seasonal precipitation shall be based on total annual precipitation using a return period of 100 years, distributed monthly in accordance with historical rainfall patterns.
- The freeboard in all three wastewater ponds shall never be less than two feet.
- The wastewaters pond shall be managed to prevent the breeding of mosquitoes.

Reporting Requirements

- Monthly report is due by the 1st day of the second month following the end of the reporting period.
- Quarterly report is due by the 1st day of the second month after the quarter.
- Reports are signed by Pat Lydon.

- For monthly reports, submit monitoring results, without the lab reports, and an instrument calibration log, and explain whether wastewater was discharged to the spray disposal field during that month or any of the limitations were violated.
- For quarterly reports, submit monitoring results, report groundwater elevations, calculate groundwater flow gradient, compare monitoring results to applicable limitations, and generate a groundwater elevation contour map.
- Annual report to be submitted by February 1st that provides summary of monitoring data obtained the previous year, and any discussion of corrective actions taken or planned to keep discharge in compliance.

Term of Permit
The permit expires in April 2007.

Appendix D-4: Camanche North Shore Wastewater Treatment Plant
Waste Discharge Requirements Order No. R5-95-175

Influent Monitoring

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Total Flow	gpd	Meter	Continuously	Monthly	--
BOD_5	mg/L	Grab	Quarterly	Quarterly	--

Pond Monitoring

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Dissolved Oxygen	mg/L	Grab	Weekly	Monthly	Not < 1.0 mg/L
pH	Standard	Grab	Weekly	Monthly	Not < 6.5 or > 9.0
Freeboard	0.1 feet	Measurement	Weekly	Monthly	Not < 2 feet
Levee condition	--	Observation	Weekly	Monthly	--
Odors	--	Observation	Weekly	Monthly	--

Effluent Monitoring (Pond 6)

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
BOD_5	mg/L	Grab	Monthly	Monthly	Daily Max: 80 / Monthly Avg: 40
Total Coliform Organisms	MPN/100 ml	Grab	Weekly	Monthly	--
Settleable Solids	ml/L	Grab	Monthly	Monthly	Daily Max: 0.5 / Monthly Avg: 0.2
Total Suspended Solids	ml/L	Grab	Monthly	Monthly	Daily Max: 80 / Monthly Avg: 40
Total Dissolved Solids	mg/L	Grab	Quarterly	Quarterly	--
Nitrate as Nitrogen	mg/L	Grab	Quarterly	Quarterly	--
Total Kjeldahl Nitrogen	mg/L	Grab	Quarterly	Quarterly	--
Sodium	mg/L	Grab	Quarterly	Quarterly	--
Chloride	mg/L	Grab	Quarterly	Quarterly	--
Standard Minerals[1]	mg/L	Grab	Annually	Annually	--

[1] Standard Minerals shall include, at a minimum, boron, calcium, magnesium, sodium, potassium, sulfate, total alkalinity (including alkalinity series), and hardness.

Spray Disposal Area Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Flow	Gallons	Continuous	Daily	Monthly	--
Rainfall	Inches	Measurement	Daily	Monthly	--
Acreage Applied (identify the fields)	Acreage	Calcluated	Daily	Monthly	--
Application Rate for each disposal field	Gal/acre-day	Calculated	Daily	Monthly	--
Sprayfield	Observation	Observation	Weekly when spraying	Monthly	--

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Depth to Groundwater	0.01 feet	Measurement	Quarterly	Quarterly
Groundwater Elevation	0.01 feet	Measurement	Quarterly	Quarterly
Gradient	feet/feet	Calculated	Quarterly	Quarterly
Gradient Direction	degrees	Calculated	Quarterly	Quarterly
Total Dissolved Solids	mg/L	Grab	Quarterly	Quarterly
Nitrate as Nitrogen	mg/L	Grab	Quarterly	Quarterly
Total Kjeldahl Nitrogen	mg/L	Grab	Quarterly	Quarterly
pH	Standard	Grab	Quarterly	Quarterly
Boron	mg/L	Grab	Quarterly	Quarterly
Chloride	mg/L	Grab	Quarterly	Quarterly
Iron	mg/L	Grab	Quarterly	Quarterly
Manganese	mg/L	Grab	Quarterly	Quarterly
Sodium	mg/L	Grab	Quarterly	Quarterly
Standard Minerals	mg/L	Grab	Annually	Annually

Water Supply Monitoring					
Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency	Limit
Electrical Conductivity	µmhos/cm	Grab	Annually	Annually	--
pH	Standard	Grab	Annually	Annually	--
Standard Minerals	mg/L	Grab	Annually	Annually	--

Sludge Monitoring
Notifiy RWQCB of sludge disposal at least 90 days in advance.

Discharge Prohibitions

- Discharge of wastes to surface waters or surface water drainage courses is prohibited.
- Bypass or overflow of untreated or partially treated waste is prohibited.
- Discharge of sewage from sanitary sewer system at any point upstream of the WWTP is prohibited.
- Discharge of hazardous waste is prohibited.
- Surfacing of wastewater outside or downgradient of the ponds is prohibited.
- The discharge of any wastewater other than that from domestic sources or domestic equivalent is prohibited.

Discharge Specifications

- No standing water in disposal area 24 hours after spraying.
- No spraying during periods of precipitation and at least 24 hours after cessation of precipitation, or when winds exceed 30 mph.
- Neither the treatment no the discharge shall cause a nuisance or condition of pollution.
- Objectionable odor originating at the facility shall not be perceivable beyond the limits of the wastewater treatment and disposal areas.
- Public contact with wastewater shall be precluded or controlled through such means as fences and signs, or acceptable alternatives.
- The WWTP shall be operated to maximize treatment of wastewater and optimize the quality of the discharge.
- The wastewater treatment, storage, and disposal system shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 25-year return frequency.
- The freeboard in all three wastewater ponds shall never be less than two feet.
- The wastewaters pond shall be managed to prevent the breeding of mosquitoes.

Reporting Requirements

- Monthly report is due by the 1st day of the second month following the end of the reporting period.
- Quarterly report is due by the 1st day of the second month after the quarter.
- Reports are signed by Manager of Water Supply.

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Appendix E:

Water Quality Discussion from the Final EIS of for the Power Fire Restoration (Insert Hardcopy)

Hydrology and Watershed Resources

Affected Environment

Physical Characteristics

The Power Fire burned portions of ten watersheds; the project area includes portions of nine watersheds (Map 8). The most important physical characteristics of those watersheds are described in Tables 3-29 and 3-30.

Table 3-29. Physical characteristics of the project area and vicinity

Terrain	▪ Elevations range from 3,600 feet at the North Fork Mokelumne River in the West Panther Creek watershed to 8,200 feet at the top of the West Cole Creek watershed. ▪ Most of the project area is between 4,000 and 6,000 feet in elevation.
Climate	▪ Average annual precipitation ranges between 45 and 65 inches, depending on elevation. ▪ Most of the precipitation falls between October and April, although localized thunderstorms can occur in the summer. ▪ The lower elevations near the N. F. Mokelumne River receive mostly rain, while the upper elevations are dominated by snow but are also subject to rain-on-snow events.
Streams	▪ Each watershed contains at least one perennial stream, all of which drain directly or ultimately into the North Fork Mokelumne River. ▪ Nearly all of the streams fall into the categories of "Rosgen type A" and "transport streams." This means that the streams are of steep gradient (> 4%), have little sinuosity, are structurally controlled by bedrock or a combination of bedrock and boulders, and tend to move sediment downstream during large storm events as opposed to storing sediment in channels and floodplains. One notable exception: short reaches of East Panther Creek have gradients of less than 2%.
Flow regulation of streams	▪ The flow of the North Fork Mokelumne River is regulated by Pacific Gas and Electric (PG&E) primarily through releases from the Salt Springs and Bear River Reservoirs. ▪ PG&E can divert water from Cole Creek, Bear River, Beaver Creek, East Panther Creek, and West Panther Creek into the Tiger Creek canal. ▪ Tiger Creek canal transfers water from Salt Springs Reservoir to the Tiger Creek afterbay. Tiger Creek afterbay is located approximately 6.5 river miles west of the project area; the North Fork Mokelumne River and Tiger Creek both drain directly into Tiger Cr. afterbay.
Beneficial uses of water[1]	▪ Beneficial uses of water are: water supplies for domestic, municipal, industrial, and agricultural use; hydroelectricity; contact and non-contact recreation; coldwater fish; and wildlife. ▪ The East Bay Municipal Utility District (EBMUD) withdraws water from Pardee Reservoir and Amador County withdraws water from Lake Tabeaud. The two bodies of water are fed by the North Fork Mokelumne River, but are located more than 20 river miles west of the project area. EBMUD provides water to approximately 1.3 million customers in the San Francisco Bay Area. ▪ Pacific Gas and Electric (PG&E) utilizes water for hydroelectric power generation; PG&E has a number of facilities in the vicinity of the project area that are part of its hydroelectric operations. A diagram of EBMUD and PG&E facilities is in Appendix A.
Aquatic life	▪ A number of streams are known to support rainbow trout (*Oncorhynchus mykiss*) and/or brown trout (*Salmo trutta*). ▪ Foothill yellow-legged frogs (*Rana boylii*), mountain yellow-legged frogs (*Rana muscosa*), and western pond turtle (*Clemmys marmorata*) are known to occur in the fire area.

[1] Beneficial uses of water are designated by the Central Valley Water Quality Control Board.

Map 8. Watersheds of the project area.

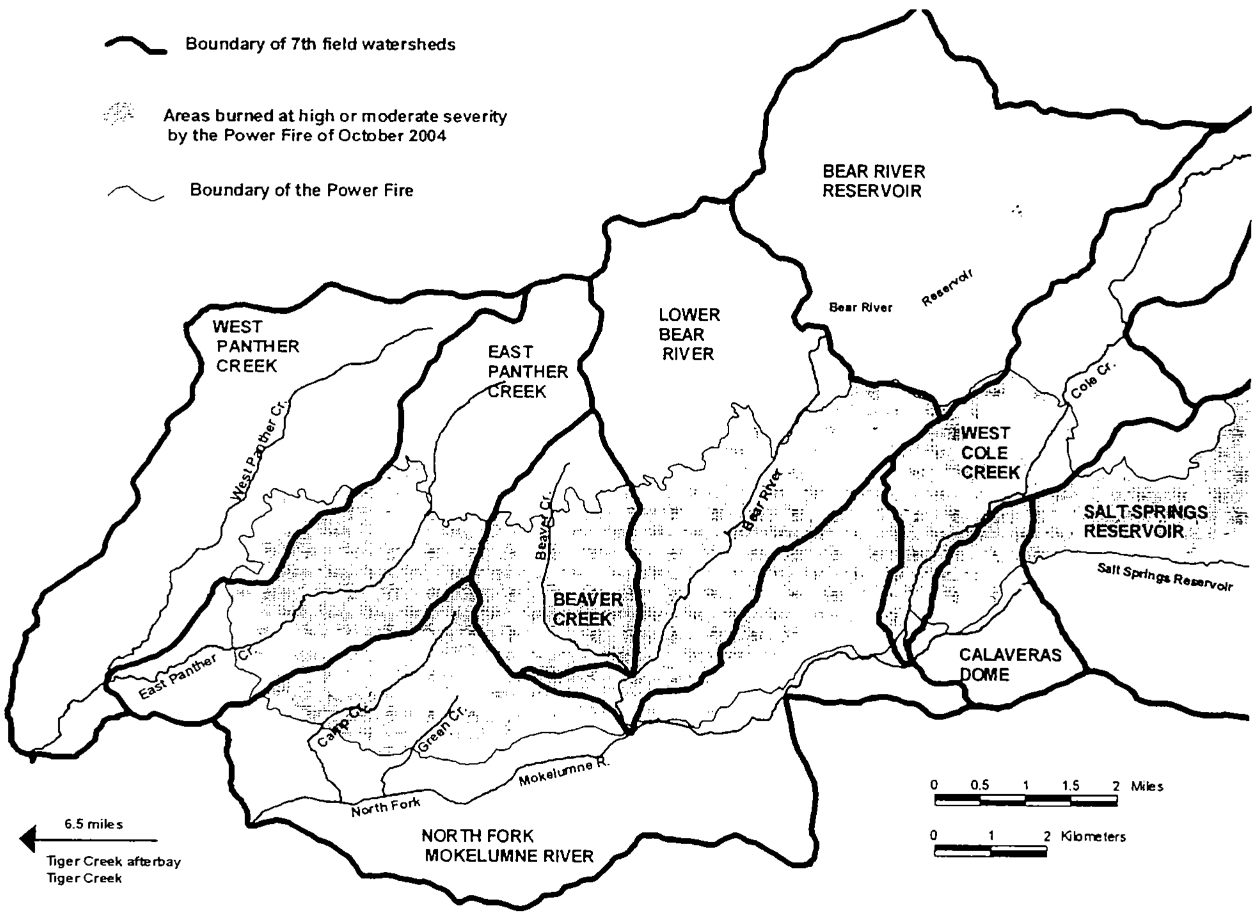


Table 3-30. Summary of the watersheds that contain the project area[1,2]

7th field HUC watershed	Salt Springs Reservoir	Calaveras Dome	West Cole Creek	Bear River Reservoir	Lower Bear River	Beaver Creek	North Fork Mokelumne River	East Panther Creek	West Panther Creek
ENF number	1401	1231	1421a	1301	1221	1211	1201	1121	1111
Total Acres	7038	1596	4972	6796	7372	2464	10589	5465	6519
Acres in National Forest	6952 (98.8%)	1596 (100%)	4532 (91.2%)	6195 (91.2%)	4320 (58.6%)	1421 (57.7%)	8141 (76.9%)	3530 (64.6%)	2152 (33.0 %)
Acres of non-federal land	86 (1.2%)	0 (0%)	440 (8.8%)	601 (8.8%)	3052 (41.4%)	1043 (42.3%)	2448 (23.1%)	1935 (35.4%)	4367 (67.0%)
Acres burned at high and/or mod. severity[3]	1282 (18.2%)	400 (25.1%)	1017 (20.5%)	16 (0.2%)	2329 (31.6%)	1411 (57.3%)	2209 (20.9%)	1650 (30.3%)	119 (2.0%)
Major perennial streams	None	North Fork Mokelumne River	West Cole Creek		Bear River	Beaver Cr.	Green Cr. Camp Cr.	East Panther Cr.	West Panther Creek
Miles of roads	16.9	5.5	34.6	50.2	53.7	18.8	55.3	36.2	50.8
Road density (miles per square mile)	1.8	2.2	6.0	4.7	4.7	4.9	4.2	4.3	5.6
Percent of watershed treated, Alternative 2	7.3%	9.3%	21.1%	0.5%	26.2%	47.2%	22.8%	22.9%	2.7%
5th field HUC watershed	Upper North Fork Mokelumne River (125,379 acres; 196 mi.^{2})			Lower North Fork Mokelumne River (113,267 acres; 177 mi.^{2})					
4th field HUC wtshd	Mokelumne River (760,321 acres; 1,188 mi.^{2})								
3th field HUC wtshd	San Joaquin River								

[1] All acres and percents are approximate. Acres for alternatives 3, 4, and 5 are the same or nearly the same as alternative 2. Actual acres of alternative 2 on the ground during project implementation could be up to 15 percent greater or less than stated.

[2] HUC = hydrologic unit code. ENF = Eldorado National Forest.

[3] Based on tree mortality as determined through aerial photographs.

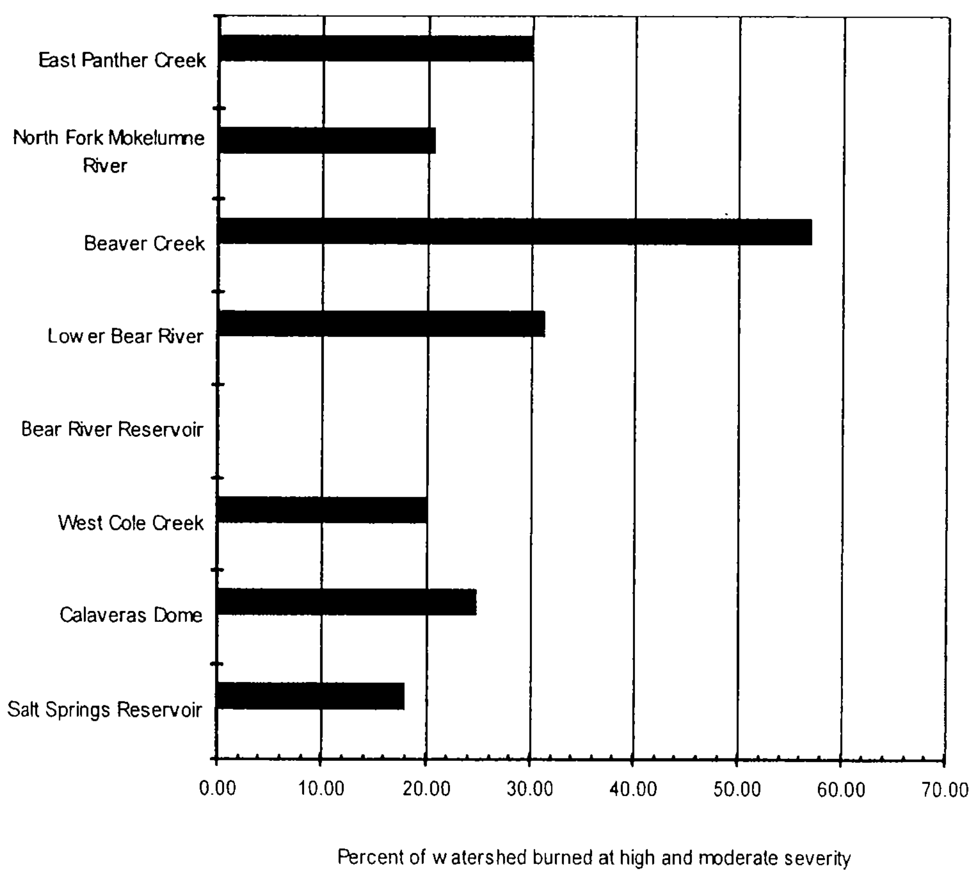
Impacts caused by the Power Fire

The Power Fire burned portions of nine watersheds in the project area at high and/or moderate severity; the Beaver Creek and East Panther Creek watersheds were the most affected (Chart 3-6). This has resulted in many eroding slopes and channels (Photo 23), which has contributed to two impacts in the project area:

Turbidity of several streams has been much higher during storm events than between storm events. This is particularly true for East Panther Creek and Beaver Creek (Chart 3-7 and Photo 24). Turbidity is a numerical measure of the clarity (or cloudiness) of water, and is frequently used as an indicator of suspended sediment concentration. Thus far, elevated levels of turbidity have been the result of ash and suspended sediment. Characteristics of turbidity and suspended sediment are described in Appendix A.

Deposition of fine-grained sediment and ash in a number of stream channels has altered habitat for aquatic organisms, particularly for fish and amphibians (Photos 15 and 16 and Chart 3-8). The perennial streams most affected are East Panther Creek, Beaver Creek, Camp Creek, and Green Creek.

Chart 3-6. Percent of watersheds burned by the Power Fire in October 2004



Impacts outside of the project area are smaller in magnitude – there has been a slight increase in turbidity and suspended sediment in the North Fork Mokelumne River and Tiger Creek afterbay during storm events. Impacts that occurred during and immediately after the Power Fire, both inside and downstream of the project area are described in detail in Table 3-31. The impacts to beneficial uses of water downstream of the project area that may occur for the next several years are discussed under Environmental Consequences (later in this section).

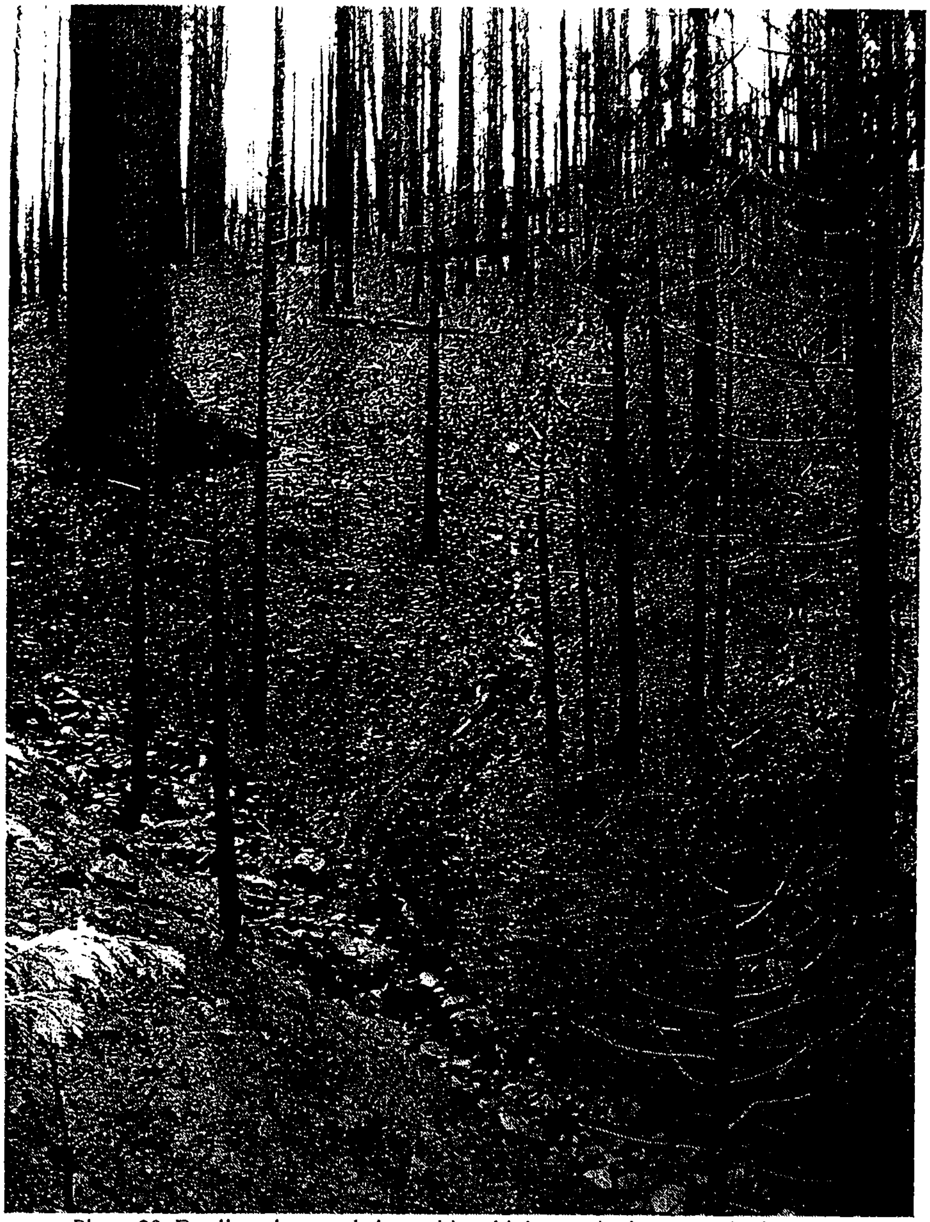


Photo 23. Eroding slope and channel in a high severity burn area in the East Panther Creek watershed. *October 2004*

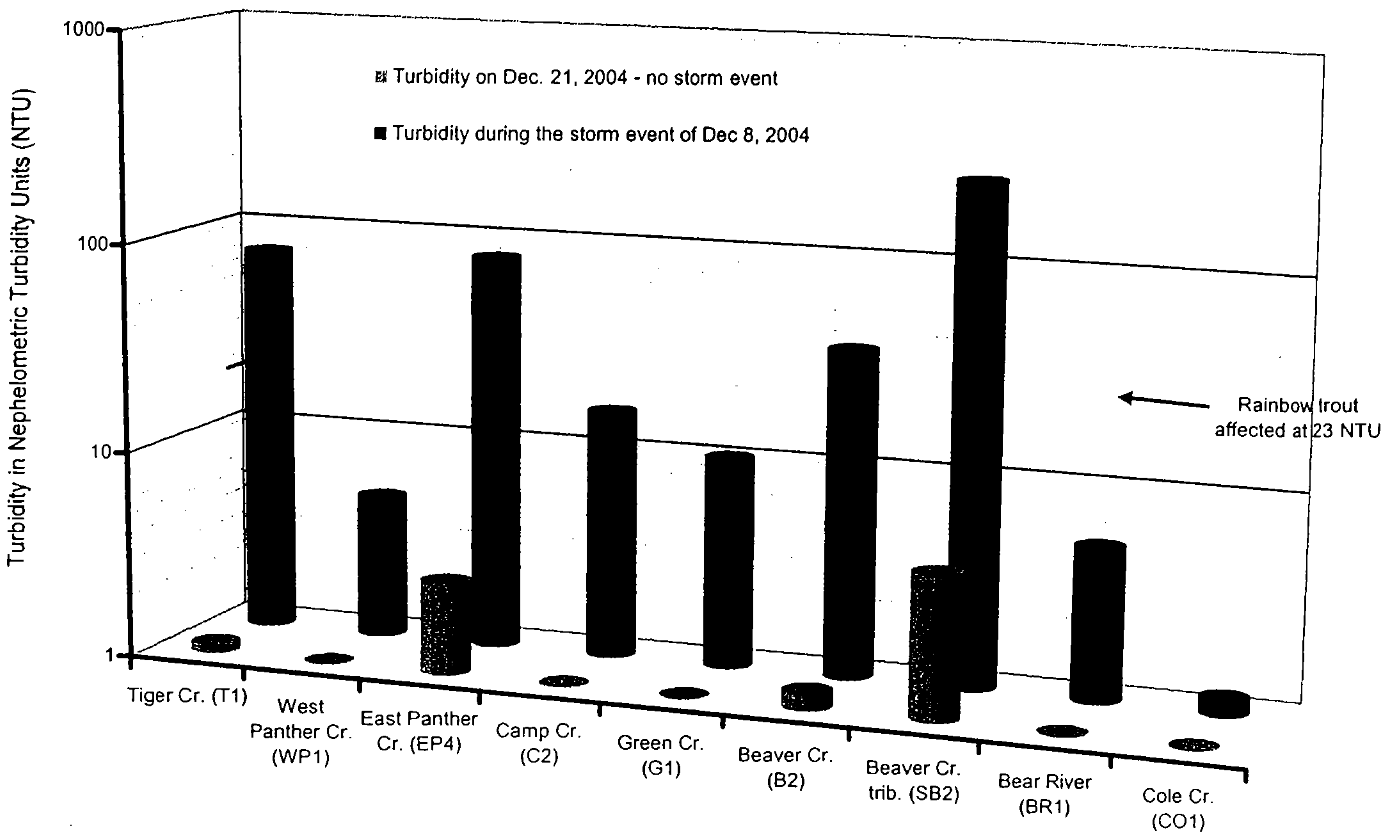
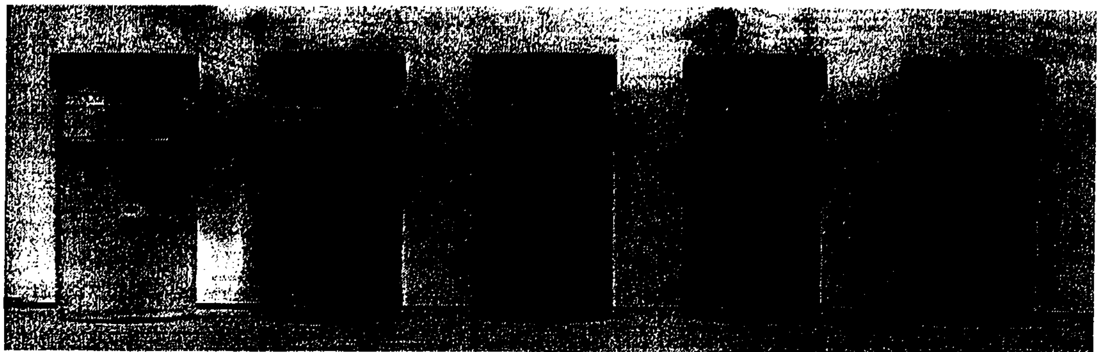


Chart 3-7. Comparison of turbidity of nine streams in December 2004.

Water samples from five streams are shown in Photo 24. The vertical scale is logarithmic so that low turbidity values are visible; values of turbidity less than 1 NTU are rounded to 1 NTU. The growth of rainbow trout (*Onchorhychus mykiss*) decreases when turbidity pulses of 23 NTU occur over a number of days (Shaw and Richardson 2001). All water samples were taken downstream of burned areas of the Power Fire, with the exception of Tiger Creek. Precipitation at the Salt Springs Reservoir totaled 2.76 inches on Dec. 7-8, 2004.



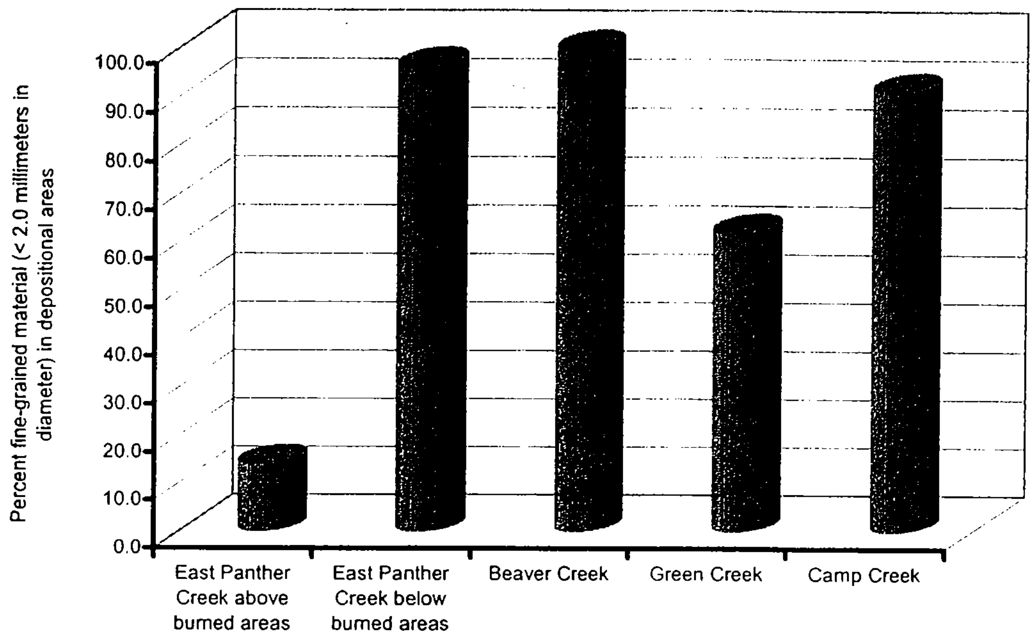
1 NTU Cole Creek | 34 NTU Beaver Creek | 77 NTU East Panther Creek | 71 NTU Tiger Creek | 230 NTU Tributary of Beaver Creek

Photo 24. Turbidity of water samples of streams during the storm event of December 8, 2004

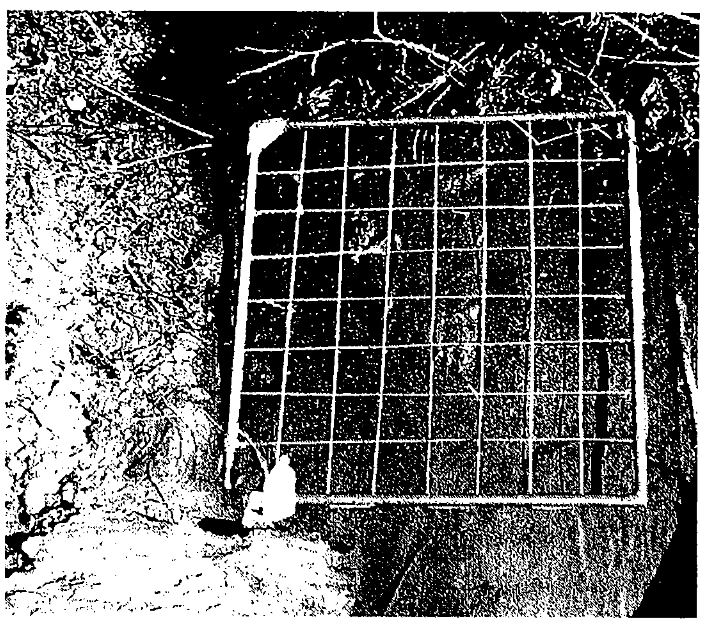
All water samples were taken downstream of burned areas of the Power Fire, with the exception of Tiger Creek. Turbidity is in Nephelometric Turbidity Units (NTU); note the visibility of the black dot on the back of the water samples. Precipitation at the Salt Springs Reservoir totaled 2.76 inches on December 7 and 8, 2004.

Photo 25. Fine-grained sediment (less than 2.0 millimeters in diameter) currently covers segments of the stream channel in East Panther Creek within and downstream of areas of high and/or moderate burn severity *November 2004.*

Chart 3-8. Percent of fine-grained sediment in depositional areas of streams in winter 2004/2005



NOTE: Measurements of Beaver, Green, and Camp Creeks were made below areas burned by the Power Fire.



The metal square is 1.2 feet on each side. *Feb. 2, 2004.*

●

The black dot has a diameter of 2.0 mm.

Photo 26. The bottom of Camp Creek in depositional areas is mostly covered with fine-grained material less than 2.0 millimeters (mm.) in diameter

Table 3-31. Summary of impacts that occurred during and immediately after the Power Fire

Project area	
Turbidity and suspended sediment concentration of streams[1]	▪ Turbidity levels of the following streams downstream of burned areas have been much higher during storm events than between storm events: East Panther Creek, Beaver Creek, and a tributary of Beaver Creek. ▪ Turbidity levels of the following streams have increased somewhat during storm events: Camp Creek, Green Creek, and Bear River. ▪ Turbidity levels of the following streams have shown only a slight increase during storm events: West Panther Creek, Cole Creek. ▪ Elevated turbidity levels are the result of both ash and suspended sediment.
Aquatic habitat for fish, amphibians, etc.	▪ Fine-grained sediment and ash has covered the bottom of pools and depositional areas of some streams. Severely affected: East Panther Creek and Beaver Creek downstream of burned areas. Moderately affected: Camp Creek and Green Creek. Mostly unaffected: West Panther Creek, Bear River, Cole Creek.
Fire fighting activities	<u>Fire retardants</u> ▪ Harm to fish and amphibians may have occurred immediately after the Power Fire as a result of fire retardants used between October 6 and 16, 2004. The fire retardants used during the Power Fire - Phos-chek WD881 and Fire-trol LCA-R - can be toxic to aquatic species if the retardants are applied to or drift into riparian areas. However, concentrations of fire retardants in streams decrease quickly downstream from the site of application (Norris and Webb 1989), but can persist for more than 21 days under some conditions (Little and Calfee 2002). Approximately 657,000 gallons of fire retardants were applied on the Power Fire; the amount of fire retardant that actually reached streams is not known. Additional details concerning fire retardants are found in Appendix A and in the Aquatic Resources section. <u>Constructed fire lines</u> ▪ Sediment delivery to perennial streams from constructed fire lines is expected to be minimal because fire lines cross perennial and seasonal streams at only 0, 1, or 2 locations in eight of the nine watersheds. Details are in Appendix A.
Electrical conductivity and pH of streams[1]	▪ Measurements between storm events and during storm events show minor changes in electrical conductivity and pH. This suggests that large increases in metals, salts, and dissolved ions in streams have not occurred. A number of research studies after wildfires have found similar results (Dissmeyer 2000).
Hydroelectric facilities	▪ All hydroelectric facilities operated by Pacific Gas and Electric (PG&E) were shut down for approximately two weeks. The primary concern was damage to the Tiger Creek canal from falling trees and the mass wasting of hillsides.
Downstream of the project area	
North Fork Mokelumne River and Tiger Creek afterbay[2]	▪ Turbidity has been only slightly elevated during storm events: turbidity was less than 5 NTU just below Salt Springs Reservoir and 16 NTU at Tiger Cr. afterbay. ▪ Parameters showing the greatest increase were total suspended solids, conductivity, calcium, silicon, aluminum, and iron. ▪ Most other parameters were unaffected or barely affected.
Water treatment facilities	▪ No significant impacts to water treatment facilities operated by the East Bay Municipal Utility District (EBMUD), or the ability of EBMUD to deliver drinking water to customers (EBMUD 2004).

[1] Based on water quality measurements by the U.S. Forest Service from Nov. 2004 through Jan. 2005. Water quality monitoring is described in Appendix A.

[2] Conclusions are based on measurements by the East Bay Municipal Utility District on October 25, 2004.

Environmental Consequences

Direct and Indirect Effects Common to All Alternatives

A large increase in the amount of sediment delivered to some streams in the project area will occur for several years after the Power Fire of October 2004. The streams most affected are expected to be Beaver Creek and East Panther Creek. Within three years after the fire, the amount of sediment delivered to streams should sharply decline as vegetative cover in burned areas increases and erosion decreases. This conclusion is based on published research where ground cover and erosion was measured following fires (Dissmeyer 2000; Roby 2000; Robichaud and Brown 1999); two examples of the results of this research are presented in Charts 3-9 and 3-10. It should be noted, however, that watershed recovery is dependent on many factors, and that more than ten years may pass before erosion rates and sediment delivery to streams returns to pre-fire levels.

Turbidity and suspended sediment concentrations of some of the streams in the project area, particularly East Panther Creek and Beaver Creek, will be elevated for the next several years during and immediately after some storm events. Such an impact appears to require a storm event of more than one inch of precipitation in 24 hours with a snow level above 4,500 feet. The above conclusions are based on water quality samples of streams in the project area during and between storm events in November and December 2004 (Chart 3-7; Appendix A). Within three years, however, turbidity and suspended sediment of streams during storms should sharply decrease. This conclusion is based the same research described above for sediment delivery to streams.

Deposition of fine-grained sediment will occur in a number of streams in the project area for the next several years during some storm events. This will reduce the size and number of pools, which affects habitat for fish and other aquatic organisms. These impacts have already occurred to some degree in several streams and may persist for a number of years (Photos 15 and 16 and Chart 3-8). This is also discussed in the Aquatic Resources section of this chapter.

Beneficial uses of water downstream of the project area *may* be impacted for the next several years as a result of the impacts in the project area described above. The primary beneficial use of concern is the ability of East Bay Municipal Utility District (EBMUD) and Amador County to deliver drinking water of acceptable quality to its customers. Potential impacts to beneficial uses of water are described in Table 3-32.

Riparian conservation objectives (RCOs) in the Sierra Nevada Forest Plan Amendment (January 2004) will not be entirely met for the next several years as a result of impacts from the Power Fire. This is discussed in detail in Appendix B.

The impacts described above are largely the result of the Power Fire of October 2004. The reasons for this have been previously described under *Impact Caused by the Power Fire,* but also include published research concerning fires and salvage logging discussed under *Differences between alternatives.* A summary of direct/indirect impacts is contained in Table 3-34.

Chart 3-9. Ground cover following the Will Fire in northeastern California. Ground cover includes that from vegetation and dead organic material (Roby 1989)

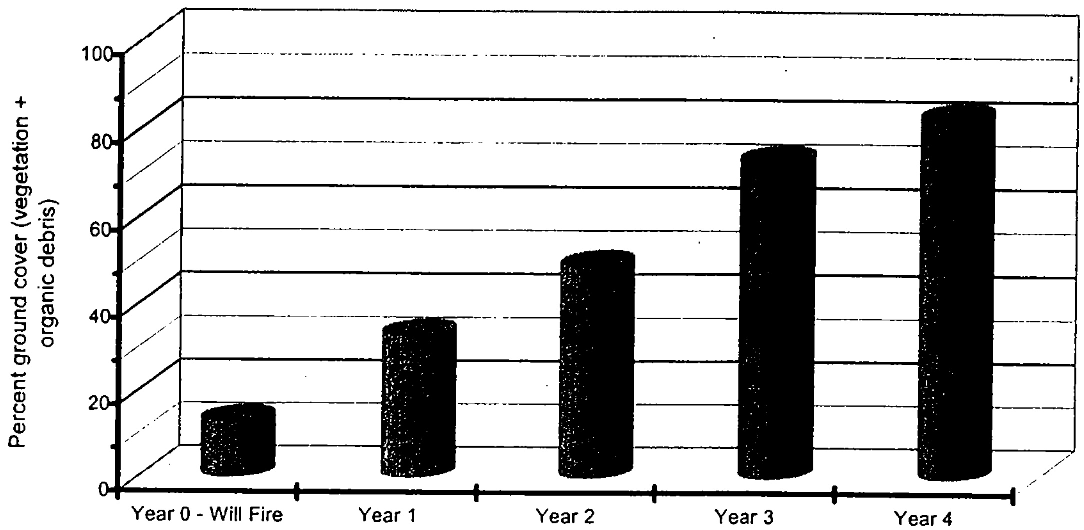
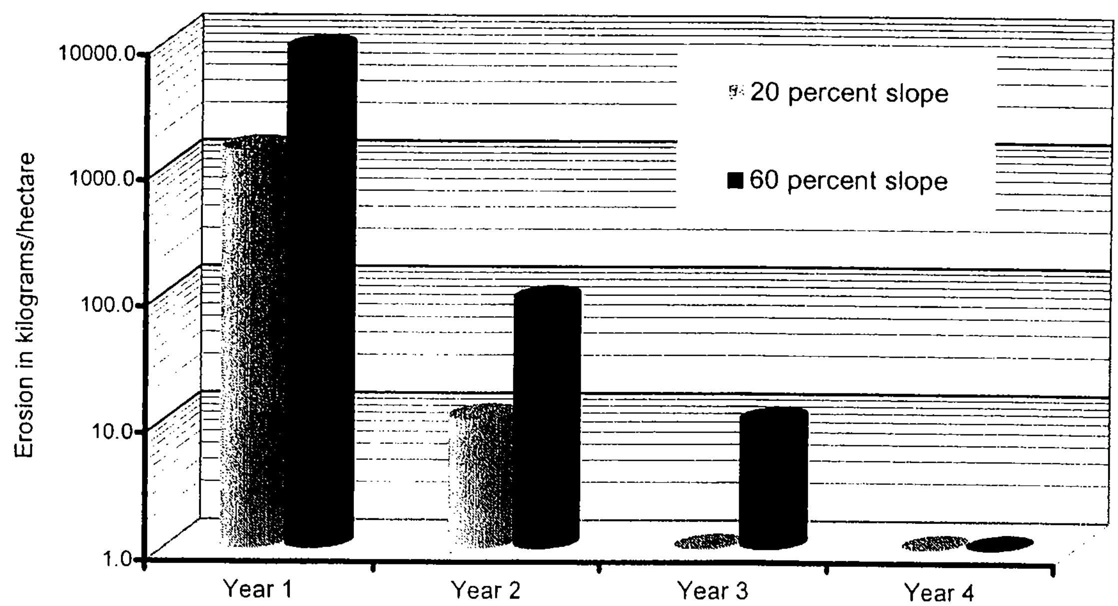


Chart 3-10. Erosion rates following a wildfire in eastern Oregon (Robichaud and Brown 1999)



NOTE: Erosion rates represent hillslope erosion, not the amount of sediment delivered to streams. Note that the vertical scale is logarithmic – erosion decreased three orders of magnitude between year 1 and year 4 after the fire. [1 hectare = 2.571 acres; 1 kilogram = 2.2 pounds.]

Table 3-32. Potential impacts to the beneficial uses of water common to all alternatives

Municipal and domestic drinking water supplies.
Impacts ▪ The ability of EBMUD and Amador County to deliver acceptable drinking water to its customers may be impaired during large storm events for the next several years.[1] The size of storm event that would have this impact is not precisely known and depends on a number factors – a general assessment of this is in *Cumulative Watershed Effects.* ▪ East Panther Creek and Beaver Creek will likely be the major contributors of sediment from the project area to the Mokelumne River. ▪ Tiger Creek, which is located outside of the project area and flows directly into Tiger Creek afterbay, is a major contributor of sediment to Tiger Creek afterbay. Evidence that supports impacts ▪ East Panther Creek, Beaver Creek, and Tiger Creek have shown elevated levels of turbidity during storm events from November 2004 through January 2005 (Photo 24 and Chart 3-7). ▪ The storm event of October 17 –20, which resulted in a combined total of 5.27 inches of precipitation at Salt Springs Reservoir, did not cause problems for downstream water treatment or regulatory compliance. However, several water quality parameters - which included turbidity and total suspended solids - were slightly elevated in Tiger Creek afterbay (EBMUD 2004). ▪ The Mokelumne River has shown only minor increases in turbidity during storm events from Nov. 2004 through Jan. 2005. This is likely because of the inflow of a number of streams to the Mokelumne River that have not been affected by the fire. ▪ A number of research studies have shown that sediment delivery to streams is extremely high the first one or two years following a wildfire, but decreases dramatically within five years (Dissmeyer 2000).
Cold freshwater fisheries
Impacts ▪ The increased delivery of sediment to streams in the project area will likely degrade habitat for fish and other aquatic organisms through the filling of pools with sediment and the deposition of fine-grained sediment to spawning areas. Impacts will likely be greatest in East Panther Creek and Beaver Creek. ▪ The fish habitat in the Mokelumne River downstream of Beaver Creek may also be impacted, but to a lesser degree than streams in the project area. ▪ Impacts to fish habitat may last a number of years. Evidence that supports impacts ▪ An increase in the sediment delivery to East Panther Creek, Beaver Creek, Green Creek, and Camp Creek has already occurred (Chart 3-8 and Photo 26). ▪ Turbidity in the Mokelumne River has been only slightly elevated during storm events: turbidity was less than 5 NTU just below Salt Springs Reservoir and 16 NTU at Tiger Cr. afterbay.
Hydro-electric power generation
Impacts ▪ Storage capacity behind Tiger Creek afterbay will be slightly decreased, but there will be minimal impacts to hydroelectric operations. (Gorham 2004). Evidence that supports impacts Conversation with Pacific Gas & Electric (Gorham 2004).
Contact and non-contact recreation
▪ Streams with turbid water are generally less aesthetically pleasing for most recreation activities. This impact will likely only occur during and immediately after large storm events.

[1] The East Bay Municipal Utility District (EBMUD) withdraws water from Pardee Reservoir and Amador County withdraws water from Lake Tabeaud. The two bodies of water are fed by the North Fork Mokelumne River, but are located more than 20 river miles west of the project area. Drinking water provided for municipal purposes is required to have a turbidity of less than 1.0 NTU, which typically requires the removal of particulates from the water source.

Direct and Indirect Effects: Differences Between Alternatives

The primary potential impact of concern is an increase in the amount of sediment delivered to streams and other aquatic features. This in turn can affect water quality (elevated levels of suspended sediment concentration and turbidity) and aquatic habitat (filling in of pools with fine-grained sediment and channel erosion). Much of the erosion from hillslopes, roads, or other features does not reach stream channels. The actual amount of eroded soil that is delivered to surface water is generally 2 to 10 percent of the erosion occurring in the watershed, and measured hillslope erosion rates do not imply that eroded soil is reaching a stream channel (Dissmeyer 2000). Major factors that influence the amount of eroded sediment that reaches streams include distance of ground disturbance from a stream, the width of an undisturbed "buffer strip" next to the stream, slope of the ground surface, precipitation characteristics, percent and type of ground cover, geology, soil characteristics, and micro-topography.

There is limited published research on measured erosion following wildfires and salvage logging; the amount of sediment delivered to streams is usually not measured. Modeling of erosion has large margins of error. For example, the predicted erosion from the commonly used Watershed Erosion Prediction Project (WEPP) has at least a 50 percent error even if all of the input parameters are fairly accurate (Elliot, et. al. 2000). In addition, erosion models such as WEPP predict erosion and not the amount of sediment that will actually reach aquatic features. There are two major reasons for this. First, some or all of factors that affect sediment delivery to streams may not be known and difficult to accurately estimate. Second, there can be great variability in the amount of sediment delivered to streams of similar characteristics from the same land disturbance. For example, salvage logging in 2001 near two streams in the Cottonwood Creek watershed in the Lassen National Forest resulted in dramatically different results. Before salvage logging, the channel bottom of Cottonwood Creek and its largest tributary consisted mostly of boulders, cobbles, and gravel. Less than one year after salvage logging, fine-grained sediment completely covered the channel bottom of a segment of Cottonwood Creek while the major tributary was nearly unchanged. There were no obvious differences in the physical characteristics of the two streams before salvage logging or in the type and severity of salvage logging activities near the two streams (Markman 2002).

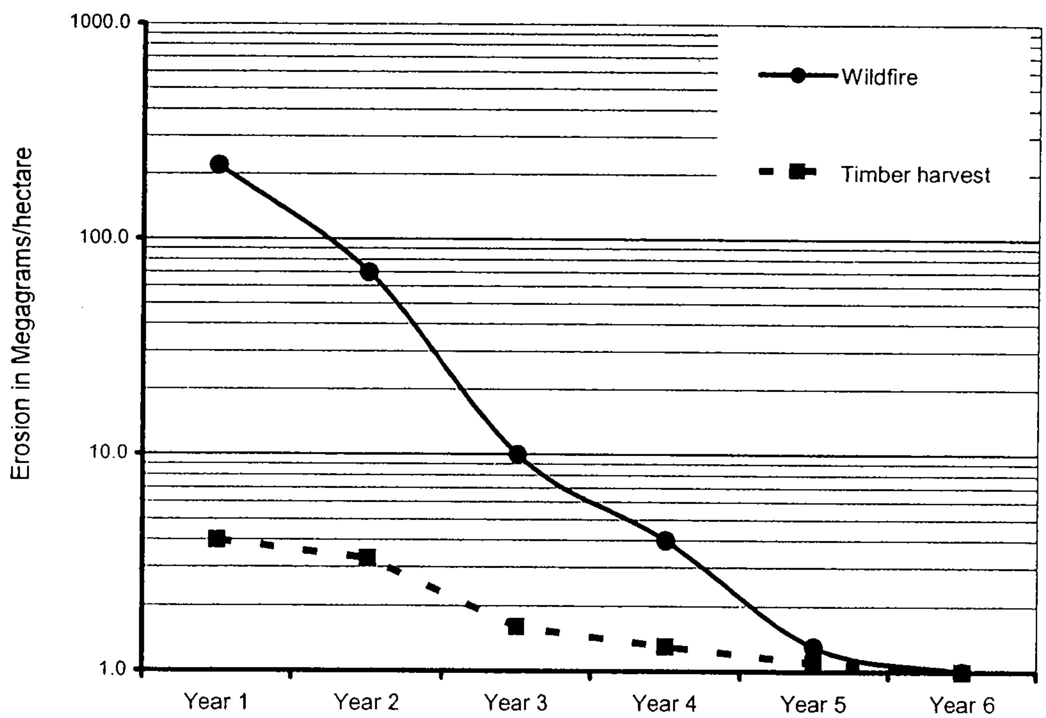
The few research studies that compare erosion from wildfire to timber harvest show that erosion for several years following wildfires is *several orders of magnitude greater* than from timber harvest activities (Elliot and Robichaud 2001); this is illustrated in Chart 3-11. This suggests that the amount of sediment delivered to streams from each of the action alternatives will likely, at most, add only slightly to that from the Power Fire. However, the action alternatives are not identical in this respect. Alternative 5 (salvage logging only by helicopter) may result in a negligible increase in sediment delivery to streams – less than alternatives 2, 3, and 4 (which includes ground-based salvage logging). This conclusion is based on the following: a.) the bulk of published research, which indicates that erosion from helicopter logging is usually far less than from ground-based systems (Dissmeyer 2000; McIver and Starr 2001; USDA 2000), and b.) removal of trees near streams (allowed within 50 feet of Beaver Creek and East Panther Creek and 25 feet of other perennial streams) with any type of ground-based yarding system will invariably cause some ground disturbance. The above conclusions assume that sediment delivery to streams shows similar trends as the research results for erosion.

The slight reduction in sediment delivery to streams from Alternative 5 when compared to the other action alternatives will most likely hold true for all of the perennial streams in Chart 3-12 with the exception of West Panther Creek. The major reason for this conclusion is the amount of skyline and tractor logging near those streams (Chart 3-12). A summary of the aspects of salvage logging that influence the amount of sediment delivered to streams and other aquatic features are in Table 3-33.

Erosion and sediment delivery to streams should decrease dramatically within a few years regardless of alternative. For example, measured erosion after salvage logging of burned areas in the Star Fire decreased approximately 95 percent between 2003 and 2004 regardless of logging system.[1] Modeled erosion following salvage logging shows a similar trend (Robichaud and Brown 1999).

Alternatives 2, 3, and 4 will result in a delay in watershed recovery of up to one year in terms of an increase in ground cover, reduction in erosion, and a decrease in sediment delivery to aquatic features. This is because ground disturbance activities associated with alternatives 2, 3, and 4 (ground-based logging in some areas) will remove at least some of the vegetation that has grown since the fire. Alternative 5 (salvage logging only by helicopter) has less of a delay in watershed recovery because ground disturbance will be less that the other action alternatives. In addition, Alternative 5 may have fewer reentries than Alternatives 2, 3, and 4 – it may not be cost-effective to salvage log small areas by helicopter after the initial major salvage logging is complete.

Chart 3-11. Modeled erosion rates for a wildfire and timber harvest in the Cascade Range of western Oregon (adapted from Elliot and Robichaud 2001)



NOTE: Erosion rates represent hillslope erosion and not the actual amount of sediment delivery to streams. Erosion from wildfire does not include erosion from timber harvest. The vertical scale is logarithmic, which means that erosion from wildfire is two orders of magnitude greater than erosion from timber harvest at year 1. [1 hectare = 2.571 acres; 1 Megagram = 1,000 kg].

[1] The Star Fire burned a portion of the Eldorado and Tahoe National Forests in late summer of 2001. The decrease in erosion is an average based on an analysis of data from 16 sites; the data is currently unpublished.

Table 3-33. Aspects of salvage logging that influence the amount of sediment delivered to streams

Ground disturbance near aquatic features
▪ There would be a number of restrictions regarding ground-disturbing activities near streams and other aquatic features. These restrictions include zones of equipment exclusion (150 feet on both sides of Beaver Creek and East Panther Creek, zones of no timber harvest (50 feet on both sides of Beaver Creek and East Panther Creek), as well as the placement of temporary roads and landings at least 300 feet from perennial streams and 150 feet from non-perennial streams. Despite these and other protection measures (for a complete list see Appendix B).It is likely that a small amount of sediment from ground-based salvage logging activities (Alternatives 2, 3, and 4) will reach streams because removal of trees near streams (allowed within 50 feet of Beaver Creek and East Panther Creek and 25 feet of other perennial streams) with any type of yarding system will likely cause some ground disturbance; such ground disturbance and potential sediment delivery to streams is partially but not completely mitigated by the required erosion control measures such as waterbars, slash, or mulch.
Hillslope erosion
▪ Woody debris would be left on the ground surface following salvage logging, which should result in effective ground cover of approximately 40% in high severity burn areas. This is more ground cover than is likely to be present under alternative 1 (no action) for the next several years in high severity burn areas. The benefits of ground cover at reducing erosion are well established. For example, a 50% cover of ponderosa pine needles reduced interrill erosion by 60% and rill erosion by 40% (Pannkuk 2003). In addition, the percent of ground cover is more important than the type of ground cover (Elliot 2005). As a result of the increase in ground cover, the amount of hillslope erosion modeled by the Watershed Erosion Project (WEPP) for the Beaver Creek watershed is actually *less* from the action alternatives than from alternative 1 (No Action). However, the results from WEPP probably underestimate the total hillslope erosion for alternatives 2, 3, and 4 because all of the ground-disturbing activities of logging - such as skid trails, landings, temporary roads, partial suspension of logs where full suspension is not possible - are not included. In addition, the results from WEPP may overestimate the decrease in hillslope erosion from the action alternatives because the modeled increase in ground cover in many of the moderate burn areas form salvage logging will not occur; many of the moderate burn areas have more than 40% ground cover as of May 2005. It should be noted that WEPP carries at least a 50% error even if all input parameters are accurate. Additional details concerning the WEPP model as applied to the project area are in Appendix C. Hillslope erosion is also discussed in the Soils section of Chapter 3.
Road activities
▪ Roads are a major source of sediment in most forested watersheds (Dissmeyer 2000). In the Six Rivers National Forest, the road network accounted for 40% of the total erosion from 30,300 acres (McCashion and Rice 1983). However, not all erosion from roads reaches streams or other aquatic features. Location is the major influence; roads that are near streams and that cross streams have the potential to deliver large amounts of sediment to streams (Dissmeyer 2000). ▪ The reconstruction of approximately 28 miles of roads involves only five crossings of perennial and seasonal streams - this means that the short-term contribution of sediment to streams from road reconstruction should be minimal. The rocking of roads at 18 perennial/seasonal stream crossings should decrease the amount of sediment delivered to Camp, Green, and West Cole Creeks. Rocked roads produced less than five% of the sediment of unrocked roads in the ENF (Coe and MacDonald 2002). The construction of 1.6 miles of temporary roads will be located more than 300 feet from perennial streams and 150 feet from seasonal streams. Overall, the action alternatives should at most have a minor effect on the amount of sediment delivered to streams from roads.
Best management practices
▪ Best management practices (BMPs) will be implemented during project operations. These BMPs have been shown to minimize non-point sources of pollution and protect water quality in the ENF. The BMPs and their effectiveness are briefly described in Appendix B. The full text of the BMPs is contained in: *Water Quality Management for Forest System Lands in California, Best Management Practices (September 2000).*

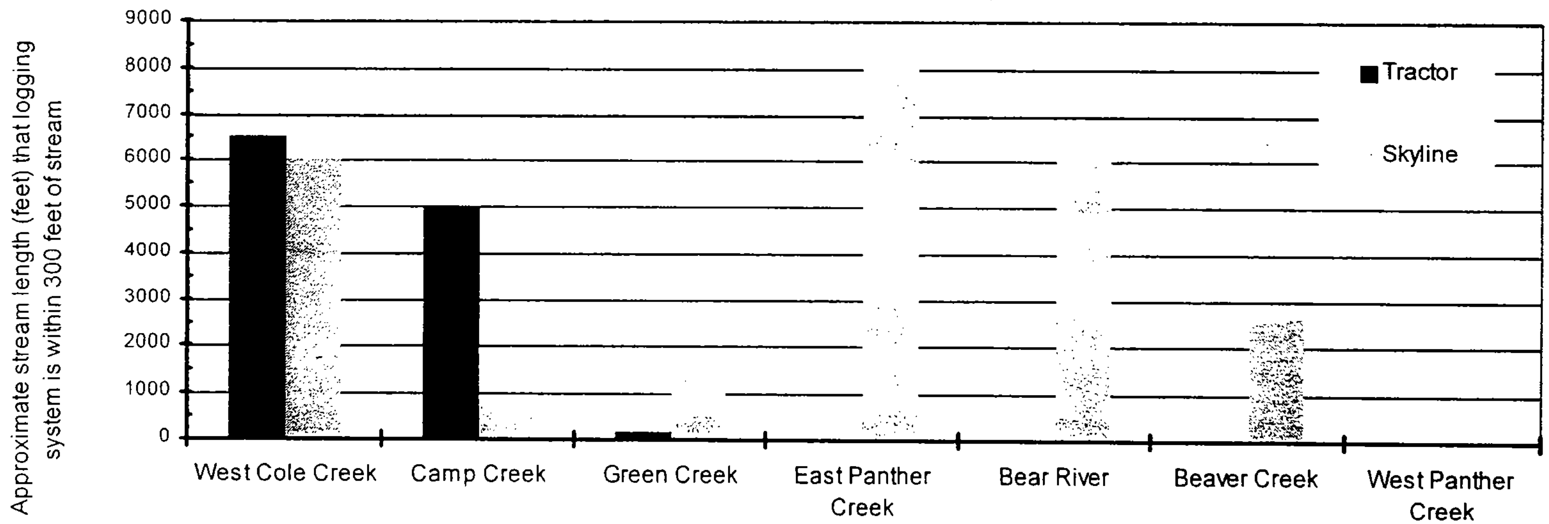
Table 3-34. Summary of direct and indirect impacts to aquatic features in the project area

	Alternative 1 (No Action) Most impacts are primarily the result of the Power Fire, although a few minor impacts are the result of fire-suppression activities.	**Alternatives 2, 3, and 4** (Salvage by tractor, skyline, and helicopter)	**Alternative 5** (Salvage logging only by helicopter)
Sediment delivery to streams	Next 1 to 3 years. ▪ Sharp increase during large storm events, particularly in Beaver Creek and East Panther Creek. After 3 years. ▪ Sharp decrease within 5 years. May take more than 10 years to return to pre-fire levels.	Next 1 to 3 years. ▪ Slightly greater than alternative 1, particularly for Beaver Cr. and East Panther Cr. After 3 years. ▪ Nearly the same as alternative 1.	Next 1 to 3 years. Negligible increase above alternative 1 (no action). Slightly less than alternatives 2, 3, 4. After 3 years. Nearly the same as alt. 1.
Water quality	Next 1 to 3 years ▪ Suspended sediment and turbidity levels of streams – particularly Beaver Cr. and East Panther Cr. - will sharply increase during and immediately after some rainfall events. After 3 years ▪ Suspended sediment and turbidity of streams during some storm events should decline sharply within 5 years. Negligible or minor changes to most other water quality parameters.		
Aquatic habitat	Next 1 to 3 years. ▪ Amount of fine-grained sediment in stream channels will increase causing degradation of habitat for fish and amphibians. Most affected: Beaver Cr. and East Panther Cr. ▪ Minor increase to stream temperatures in the summer because of the loss of mature vegetation (such as trees) that provides shade to the stream surface. ▪ Increase of LWD in many streams as some fire-killed trees next to streams fall into channels. After 3 years. ▪ Moderate to minor degradation of habitat for fish as time passes - high-gradient streams transport much of the fine-grained material downstream and out of the project area within a relatively short period of time. ▪ Overall increase of LWD in many streams while fire-killed trees near streams fall over and reach stream channels, then a long period of no LWD recruitment until new forest grows. ▪ Minor increase in stream temperatures after most of the fire-killed trees near streams fall, but partially mitigated by the growth of other riparian vegetation.	Next 1 to 3 years. ▪ Slightly greater negative impacts than alt. 1 After 3 years. ▪ Similar to alternative 1. ▪ Exception: Less LWD in streams than alternative 1. ▪ Exception: Less LWD in ephemeral streams under alt. 4 than other alternatives.	Next 1 to 3 years. Negligible change to aquatic habitat above alt. 1 After 3 years. Similar to alternatives 2, 3, and 4.

Water yield and stream-flow	Next 1 to 3 years. ▪ Minor increase (less than 20%) in water yield and peak flows of some streams because of absence of vegetation in high/moderate burn areas (MacDonald, et. al. 2004). ▪ After 3 years. ▪ Minor or negligible change as vegetation becomes reestablished.	▪ Nearly the same as alternative 1.	
Watershed recovery	▪ Sharp decline in erosion rates and stabilization of stream channels within 5 years, but may take more than 10 years to return to pre-fire levels.	▪ Delayed by up to 1 year.	▪ Less of a delay than alternatives 2, 3, 4.

NOTE: LWD = large woody debris. Aquatic habitat is discussed in more detail in the Aquatic Resources section.

Chart 3-12. Comparison of skyline and tractor logging systems near major perennial streams for Alternatives 2, 3, and 4



Cumulative watershed effects

Cumulative watershed effects (CWE) consider the impacts of all of the alternatives when combined with past, present, and foreseeable land disturbances. The land disturbances include past timber harvest in the National Forest, past timber harvest on private land, roads, salvage logging on private land, the Power Fire, the action alternatives, and man-made impervious areas associated with buildings and other facilities. These land disturbances were selected for the analysis of CWE because they have resulted or have the potential to result in erosion and an increase in sediment delivery to aquatic features. The geographic scope of the CWE analysis includes the nine watersheds where salvage logging of areas burned by the Power Fire is proposed (Map 8).

There are a number of methods currently used to assess cumulative watershed effects (CWE) where the primary direct impact of concern is an increase in sediment delivery to streams and other aquatic features. None of these methods can quantitatively predict the amount of sediment delivered to streams, the distance downstream that the sediment load will travel, or point in time and the duration when an increase in sediment delivery to aquatic features will occur. The reasons for this include the large variability in the magnitude of direct effects from a given land disturbance, inability to predict secondary or indirect effects, lack of data on recovery rates for land disturbances, difficulty of validating predictive models on-the-ground, and the uncertainty of future events such as the size and timing of large storms. As a result, an assessment of CWE is frequently reported as an indicator of the overall *risk* of cumulative effects occurring in a watershed (Reid 1993; MacDonald 2000).[1]

The method selected for this CWE analysis is the method of Equivalent Roaded Acres (ERA). This method was developed by Region 5 of the U.S. Forest Service and adapted by the Eldorado National Forest (ENF). The method was specifically developed to assess the *risk* of CWE in forested watersheds where timber harvest and roads are major land disturbances. The ERA method has been used in the ENF for over 15 years, and nearly all of the 150 watersheds in the ENF have been evaluated with this method. This allows all of the watersheds in the ENF to be compared relative to each other in terms of the risk of CWE.

In the equivalent roaded acre (ERA) method, an index is calculated for an entire watershed that expresses most land uses in terms of the percent of the watershed covered by roads. Based on the percent ERA and a threshold of concern (TOC), a given watershed is assigned a relative risk – low, moderate, high, or very high - of cumulative impacts. A "very high risk" is merely a warning that cumulative impacts – such as an increase in sediment delivery to streams – might occur. The ERA method has the same limitations as previously described for all commonly used CWE methods where an increase in sediment delivery to streams is the primary concern. The ERA method and its limitations are discussed in more detail in Appendix D. Additional analysis for the impacts caused by the Power Fire and the alternatives has been previously presented in *Impacts caused by the fire* and *Direct/indirect impacts.*

[1] As a result of the current limitations of the analysis of cumulative watershed effects, Oregon has adopted an alternative approach – assessments of cumulative effects for forest management activities have been waived in favor of an emphasis on minimizing on-site changes (MacDonald 2000).

Eight of the nine watersheds in the project area are at a "very high risk" of CWE in 2005 - this is largely the result of the Power Fire. The number of watersheds at a "very high risk" of CWE decreases in 2006 and again in 2010 largely because of the fairly rapid recovery of areas burned by the Power Fire. Overall, watershed recovery is faster under Alternative 5 than under the other action alternatives – alternative 5 results in fewer watersheds at a "very high risk" of CWE in 2010 because logging all salvage areas by helicopter generates fewer equivalent roaded acres than ground-based logging (Chart 3-13; Table 3-35). Calculations of equivalent roaded acres for each watershed are in Appendix D.

For all watersheds, the summation of all land uses for each alternative results in a similar trend – the values for equivalent roaded acres peak in 2005 (as a result of the Power Fire) and then decrease steadily towards 2010. This is illustrated for the Beaver Creek watershed in Chart 3-14.

The ERA method only addresses the *risk* of CWE; it does not mean that a large increase in sediment delivery to streams and the resulting impacts *will* occur. However, the results of the ERA model combined with additional evidence indicates that CWE are likely to occur in several watersheds in the project area, particularly Beaver Creek and East Panther Creek, *if* a large storm event occurs in the next several years. The major reasons for this conclusion are described in Table 3-36. By 2010, the results of the ERA model suggest that the cumulative impacts in the project area may be slightly less under Alternative 5 than the other action alternatives (Chart 3-13).

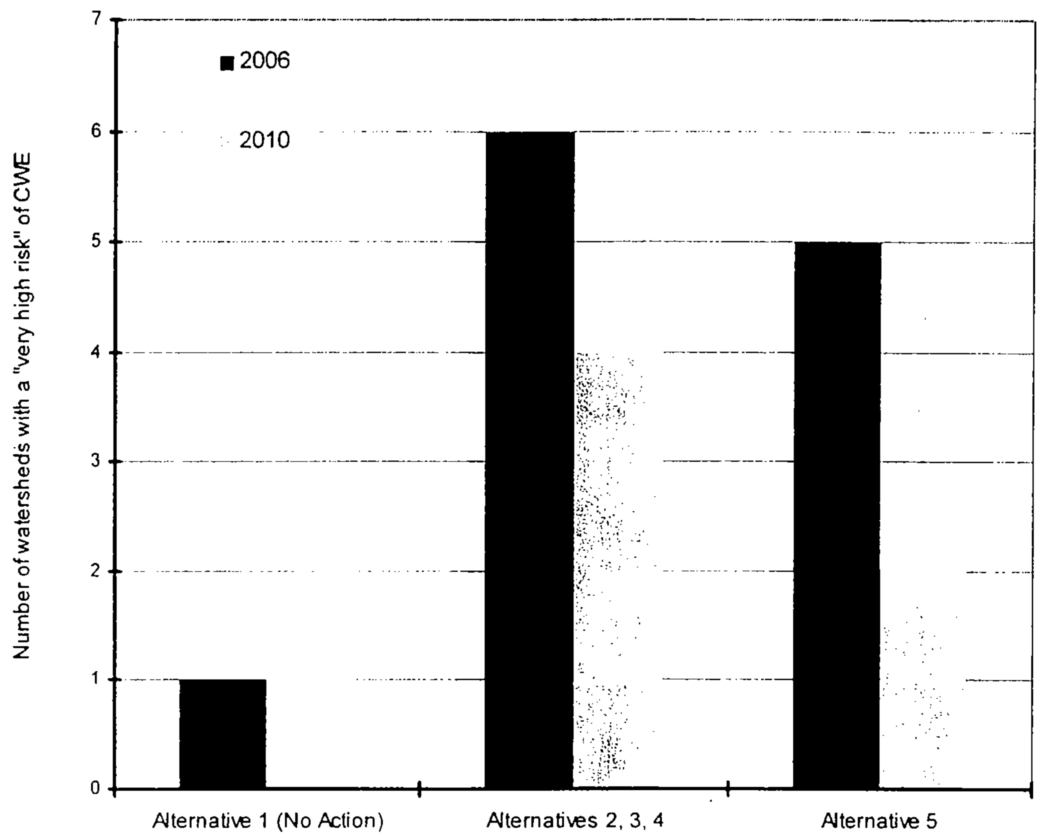
Downstream of the project area, beneficial uses of water could be affected as a result of cumulative impacts in the project area. The primary beneficial use of concern downstream of the project area is the ability of EBMUD and Amador County to provide drinking water of suitable quality. The severity of cumulative impacts in the project area, as well as to downstream beneficial uses of water, depends largely on an event that cannot be prevented and the exact timing of which cannot be accurately predicted - whether a "large storm event" occurs during the time window of the next few years when the watersheds are recovering from the Power Fire and fire salvage activities and vulnerable to erosion.[1] The minimum size defined as a "large storm event" in the project area for this analysis is 4.3 inches of rain in 24 hours, and the probability of this event occurring in any given year is approximately 50 percent.[2,3] As a result of the importance of large storm events in determining actual erosion, sediment delivery to streams, turbidity and suspended sediment levels of streams, the alternatives themselves play a relatively minor role in the severity of impacts to beneficial uses of water downstream of the project area. The relative severity of cumulative impacts for several storm events is described in Table 3-37.

[1] This conclusion is supported by historical events. One example: "The effect of wildfire on drinking water was graphically demonstrated when the Buffalo Creek fire in Colorado in 1996 was followed by heavy rains, forcing municipal water supplies to shut off, one of Denver's water treatment plants to close, months to be spent cleaning a water-supply reservoir, and the Coors Brewing Company to bring in water by truck." Source of quotation: Dissmeyer 2000.

[2] Source: Miller 1973. The probability of the occurrence of storm events is based on long-term averages; the precipitation events are not evenly spaced in time. This means that the 2-year, 24-hour event (4.3 inches) may not occur for 10 years and then occur several times in the same year. Additional information on recurrence intervals for flood and precipitation events can be found at the following internet address: http://md.water.usgs.gov/floods/faq.html

[3] The selection of the 2-year, 24-hour precipitation event (4.3 inches) as a "large storm event" for the project area is based on the monitoring of turbidity of streams during storm events in the winter of 2004/2005. For example, 2.76 inches of rain on Dec. 7-8 resulted in somewhat elevated turbidity levels of a few streams and little change in the turbidity of a number of other streams.

Chart 3-13. Number of watersheds in the project area with a "very high risk" of cumulative watershed effects (CWE) for each alternative



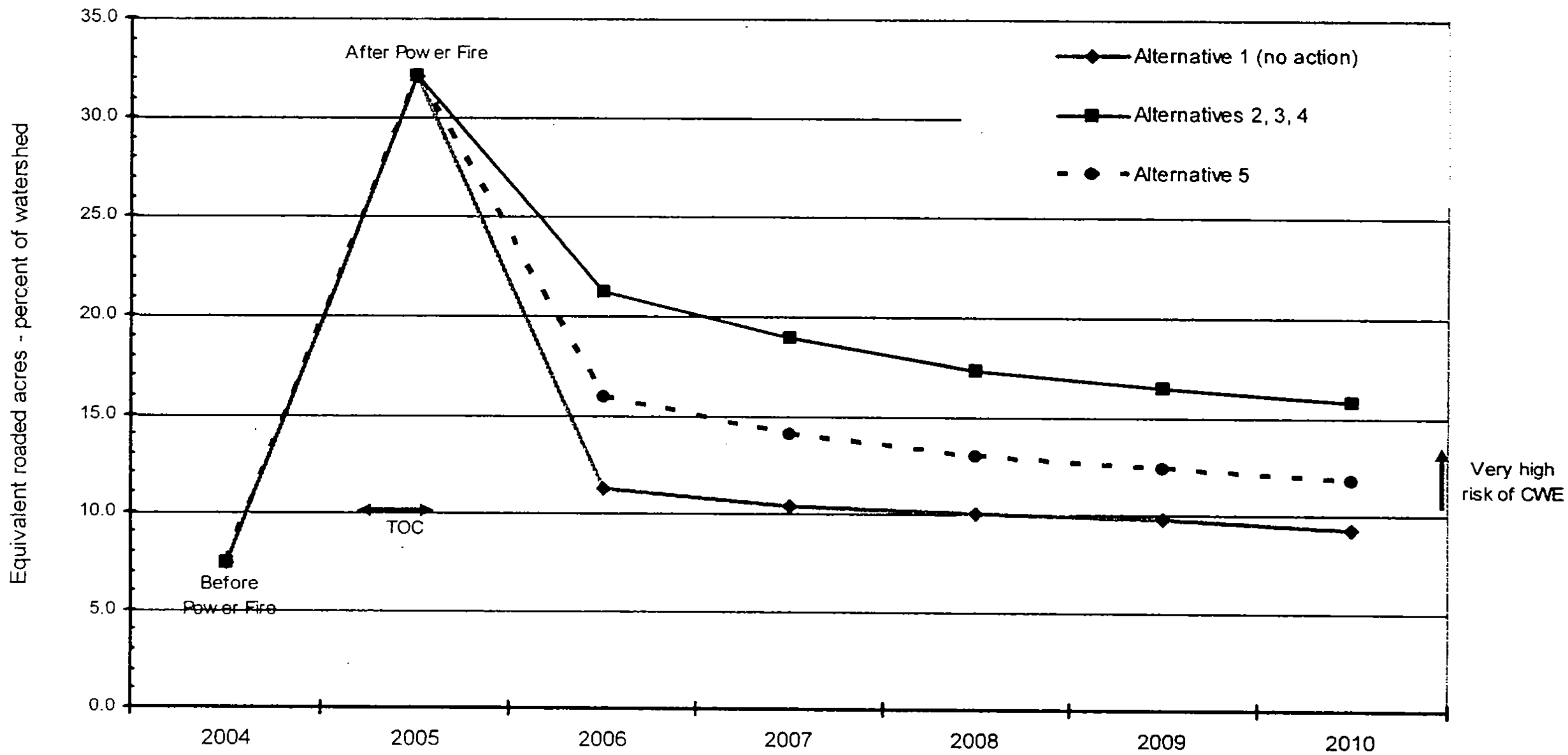
NOTE: The risk of CWE presented above is based solely on the method of equivalent roaded acres (ERA). The risk of CWE from the ERA method does *not* take into account a major factor that determines the *severity* of cumulative effects: the occurrence of large storm events during the next few years when the watersheds are recovering from the Power Fire and fire salvage activities and vulnerable to erosion. The relative severity of cumulative effects for several storm events is presented in Table 3-37. The ERA method is discussed in Appendix D.

Table 3-35. Risk of cumulative watershed effects (CWE) for individual watersheds in years 2005, 2006, and 2010.[1,2]

		Alternative 1 No action		Alternatives 2, 3, 4		Alternative 5		Major land disturbances[3]
	2005	2006	2010	2006	2010	2006	2010	
Salt Springs Reservoir	Very high	Low	Low	Low	Low	Low	Low	Past timber harvest on National Forest.
Calaveras Dome	Very high	Low	Low	Low	Low	Low	Low	Power Fire of October 2004.
West Cole Creek	Very high	Mod.	Mod.	Very high	High	High	Mod.	▪ Past timber harvest on National Forest. ▪ Power Fire of October 2004.
Bear River Reservoir	Mod.	Mod.	Mod.	Mod.	Mod.	Mod.	Mod.	Past timber harvest on National Forest.
Lower Bear River	Very high	High	Mod	Very high	Very high	Very high	High	▪ Past timber harvest on National Forest and on private land. ▪ Power Fire of October 2004.
Beaver Creek	Very high	Very high	High	Very high	Very high	Very high	Very high	▪ Power Fire burned large part of watershed at high/moderate severity.
East Panther Creek	Very high	High	Very High	Very high	Very high	Very high	Very High	▪ Past timber harvest on National Forest and on private land. ▪ A total of approx. 600 acres of salvage logging on private land in 2005. ▪ A total of approx. 398 acres of timber harvest in 2006 on private land in the East Panther Creek watershed.
North Fork Mokelumne River	Very high	High	Mod.	Very high	Very high	Very high	High	▪ Past timber harvest on National Forest and on private land. ▪ A total of nearly 300 acres of salvage logging on private land in 2005 in the drainage areas containing Camp Creek and Greek Creek. ▪ Power Fire of October 2004. ▪ A total of approximately 50 acres of timber harvest in 2006 on private land.
West Panther Creek	Very high	High	High	Very high	High	Very high	High	Past timber harvest on private land.

[1] The risk of CWE is based on percent equivalent roaded acres (ERA). The method for calculating ERA and assigning the risk of CWE is described in Appendix D.
[2] The year 2006 is approximately one year after the implementation of any of the action alternatives, and the year 2010 is approximately five years after the implementation of any of the action alternatives.
[3] Roads are a notable land disturbance in all watersheds. The Power Fire was not listed as a major land disturbance if less than 10% of the watershed was burned at high and/or moderate severity. The rocking of roads and reconstruction of roads are not included in calculations of equivalent roaded acres.

Chart 3-14. Equivalent roaded acres for the Beaver Creek watershed



NOTE: The threshold of concern (TOC) for cumulative watershed effects (CWE) in the Beaver Creek watershed is 10.0 percent.

Table 3-36. Major reasons that support the conclusion that cumulative watershed effects are likely to occur in several watersheds in the project area

1	• For alternatives 2, 3, and 4, six of the nine watersheds will be at a "very high risk" of cumulative watershed effects in 2006 according to the method of equivalent roaded acres (Table 3-35).[1] The method of equivalent roaded acres has been previously described on the previous page and is discussed in more detail in Appendix D.
2	• An increase in sediment delivery to several perennial streams has already occurred. East Panther Creek and Beaver Creek have shown elevated levels of turbidity during storm events in the winter of 2004. Depositional areas in the channels of four streams – East Panther Creek, Beaver Creek, Camp Creek, and Green Creek – are now largely covered with fined-grained material (less than 2.0 millimeters in diameter). These impacts have been previously discussed under *direct/indirect impacts.*
3	• The Power Fire of 2004 is a major reason for the "high risk" of CWE in the East Panther and Beaver Creek watersheds for the next several years. Large areas of these watersheds burned at high and moderate severity, resulting in large areas of eroding slopes near streams. This is discussed under *Impacts caused by the Power Fire.*
4	• Salvage logging on private land – a total of approximately 900 acres – is scheduled in 2005 in the Beaver Creek, East Panther Creek, and North Fork Mokelumne River watersheds. In the North Fork Mokelumne River watershed, most of the salvage logging on private land is in the drainage areas containing Green Creek and Camp Creek. Some salvage logging on private land has already occurred near Beaver Creek.
5	• Six of the eight watersheds have a road density of greater than 4.0 miles per square mile, and the surface of many of these roads are not currently paved or rocked. Roads are often the major chronic anthropogenic source of sediment to streams in forested watersheds (Dissmeyer 2000). In the Eldorado National Forest, native surface roads have been shown to produce 10 to 50 times more sediment than rocked roads (MacDonald, et. al. 2004). In addition, roads, unlike many land disturbances, do not revegetate with time. This means that erosion from roads persists for as long as the roads exist.[1]

[1] Under all action alternatives, the rocking of approximately 15 miles of roads (which includes 5 perennial stream crossings and 13 seasonal stream crossings) should reduce erosion of roads in the long-term. The perennial streams that will most benefit from rocking are Camp Greek, Green Greek, and West Cole Creek. The rocking of roads and reconstruction of roads are not reflected in the numerical calculations of equivalent roaded acres.

Table 3-37. Relative severity of cumulative impacts in the project area and to downstream beneficial uses of water for several storm events for all alternatives [1,2]

<table>
<tr><th>Snow level</th><th>Precipi-tation in 24 hours</th><th>Recurrence interval and prob. of occurrence[3]</th><th>Severity of cumulative impacts in the project area</th><th>Severity of impacts to beneficial uses of water downstream of the project area as a result of erosion in the project area [4,5]</th></tr>
<tr><td>Less than 4,000 feet</td><td>Any amount</td><td></td><td colspan="2"><u>Negligible</u>
• The project area is above 4,000 ft. in elevation. Storms with snow levels less than 4,000 ft. will deposit snow - not rain - on the project area. As a result, erosion and sediment delivery to streams in the project area will be negligible. This translates to little change to turbidity and suspended sediment levels of streams in the project area and no impacts to downstream beneficial uses of water.</td></tr>
<tr><td rowspan="4">Greater than 5,000 feet</td><td>1.0 inches</td><td></td><td colspan="2"><u>Negligible.</u>
• A minor increase in turbidity and suspended sediment of some streams in the project area results in negligible impacts to downstream beneficial uses of water.</td></tr>
<tr><td>2.0 inches</td><td></td><td><u>Low.</u>
• Moderate increase in turbidity and suspended sediment of some streams.</td><td><u>Negligible.</u>
• Minor increase of turbidity and suspended sediment of the North Fork Mokelumne River.</td></tr>
<tr><td>4.3 inches</td><td>2-year, 24-hour. 50% probability.</td><td><u>Moderate to high.</u>
• Sharp increase in turbidity and suspended sediment of all or most streams.</td><td><u>Low to moderate.</u>
• Moderate increase in turbidity and suspended sediment of the North Fork Mokelumne River.</td></tr>
<tr><td>6.5 inches</td><td>10-year, 24-hour. 10% probability.</td><td><u>High to very high.</u>
• Dramatic increase in turbidity and suspended sediment levels of all streams.</td><td><u>Moderate to high.</u>
• Large increase in turbidity and suspended sediment of the North Fork Mokelumne River.</td></tr>
</table>

[1] There may be slight differences between the alternatives for "large storm events" - the severity of impacts may be slightly greater under alternatives 2, 3, and 4 than under alternatives 1 and 5. The minimum size defined as a "large storm event" in the project area is 4.3 inches of rain in 24 hours. Conclusions are based on water quality data from streams in the project area in winter 2004/2005, the *risk* of cumulative effects based on the equivalent roaded acres for each alternative, and professional judgment. Actual impacts depend on a number of factors, such as antecedent moisture, flow regulation of streams, and rain-on-snow. This table only presents a few possible scenarios.

[2] The primary cumulative impact that is likely to occur is a large increase in the amount of sediment delivered to streams – this would result in high levels of turbidity and suspended sediment of streams, excessive deposition of fine-grained material in stream channels, and an overall degradation of habitat for aquatic life. The beneficial use of water of most concern is the temporary interruption of the North Fork Mokelumne River as a drinking water source during and after large storm events as a result of elevated levels of turbidity.

[3] The probability of 4.3 inches of precipitation (2-year, 24-hour event) occurring in any given year is 50 percent, and the probability of 6.5 inches of rain occurring in any given year is 10 percent. Recurrence intervals are based on long-term averages and the precipitation events are <u>not</u> evenly spaced in time. This means that the 10-year precipitation event may not occur for 30 years and then occur for three consecutive years. Source: Miller 1973.

[4] The severity of impacts to beneficial uses of water downstream of the project area is less than the severity of cumulative impacts in the project area for three major reasons: a) dilution of turbidity and suspended sediment levels in the North Fork Mokelumne River by the inflow of tributaries that are not affected by the Power Fire and therefore are likely to see less elevated levels of turbidity and suspended sediment, b) much of the suspended sediment in the North Fork Mokelumne River settles to the bottom of Tiger Cr. afterbay, and c) the major water withdrawals from the Mokelumne River (at Pardee Reservoir and Lake Tabeaud) for beneficial uses of water are more than 20 river miles downstream of the project area.

[5] Tiger Creek, which flows directly into Tiger Creek afterbay approximately 6.5 miles west of the project area, is a major source of sediment during storm events.

Conclusions

The following impacts apply to all of the alternatives.

- A large increase in the amount of sediment delivered to some streams in the project area will occur for several years after the Power Fire of October 2004. Within three years after the fire, the amount of sediment delivered to streams should sharply decline.
- Turbidity and suspended sediment concentrations of some of the streams in the project area will be elevated for the next several years during and immediately after some storm events.
- Deposition of fine-grained sediment will occur in a number of streams in the project area for the next several years during some storm events. This will likely affect habitat for fish and other aquatic organisms to some degree for a number of years.
- The three impacts listed above will likely be the most pronounced in Beaver Creek and East Panther Creek.
- Cumulative watershed effects (CWE) - primarily an increase in the amount of sediment delivered to streams - are likely to occur in several watersheds. However, the number of watersheds at a "very high risk" of CWE decreases between 2005 and 2010.
- Beneficial uses of water downstream of the project area may be impacted for the next several years during and immediately after "large storm events."1,2
- The severity of cumulative impacts in the project area, as well as to downstream beneficial uses of water, depends largely on whether a "large storm event" occurs during the time window of the next few years when the watersheds are recovering from the Power Fire and fire salvage activities and vulnerable to erosion.1
- Riparian conservation objectives (RCOs) in the Sierra Nevada Forest Plan Amendment (January 2004) will not be entirely met for the next several years.

The following impacts apply to the indicated alternative(s).

- The amount of sediment delivered to streams from alternative 1 (no action) will be several orders of magnitude greater than from salvage logging associated with any of the action alternatives. This means that the amount of sediment delivered to streams from the action alternatives will likely at most add only slightly to that from alternative 1.
- Alternatives 2, 3, and 4 may result in a slight short-term increase in sediment delivery to streams when compared to alternative 1 (no action). Alternative 5 (salvage logging only by helicopter) will likely result in a negligible increase in the amount of sediment delivered to streams when compared to alternative 1 and slightly less than the other action alternatives.
- In terms of direct and indirect effects, alternatives 2, 3, and 4 will result in a delay in watershed recovery of up to one year when compared to alternative 1. Alternative 5 has less of a delay in watershed recovery than the other action alternatives.
- In terms of the number of watersheds at a "very high risk" of CWE, watershed recovery is faster under alternatives 1 and 5 than alternatives 2, 3, and 4. This suggests that the magnitude of cumulative effects may be less under alternatives 1 and 5 than alternatives 2, 3, and 4 if a "large storm event" occurs in the next few years.[1]

---

[1] The minimum size defined as a "large storm event" in the project area is 4.3 inches of rain in 24 hours; the probability of such an event occurring in any given year is approximately 50 percent.

[2] The primary beneficial use of concern is the ability of East Bay Municipal Utility District (EBMUD) and Amador County to deliver drinking water of acceptable quality to its customers.

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Ecological Effects of Fire Retardant Chemicals and Fire Suppressant Foams

Description of Chemicals

hos Chek G75F.

hos-Chek G75-F is a proprietary formulation composed of monoammonium phosphate and ammonium sulfate, ıgitive coloring agent, and small amounts of gum-thickener, bactericide, and corrosion inhibitor (National Wildfire 'oordinating Group, Fire Equipment Working Team 1991). Phos-Chek is typically applied from helicopter bucket or round tanker in advance of a fire; other retardants with higher viscosity are applied from fixed-wing aircraft. The mmonium salts retard fire by chemically combining with cellulose as fuels are heated, as well as through evaporative ooling of the fuels. Phos-Chek is supplied by the manufacturer as a powder, which is mixed with water to the desired oncentration before application.

ilv-Ex.

ilv-Ex concentrate is a proprietary mixture of sodium and ammonium salts of fatty alcohol ether sulfates, higher cohols, and water, as well as butyl carbitol and ethyl alcohol (Ansul, Incorporated 1994). It functions as a surfactant .e. detergent), allowing water to penetrate and expand over the surface of fuels to both cool and smother the fire. Silv-x, like other Class A foams, is applied operationally either from ground tankers or helicopters. Silv-Ex is supplied by ıe manufacturer as a liquid concentrate, which is mixed with water to the desired concentration before application.

ire-Trol GTS-R.

ire-Trol GTS-R is a proprietary mixture of ammonium sulfate, diammonium phosphate, guar gum thickener, spoilage hibitor, corrosion inhibitor, and iron oxide as a coloring agent to mark aerial drop sites (Chemonics, Inc., Phoenix, Z). It functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. ormulation effectiveness depends on the amount r unit surface area. Fire-Trol GTS-R is usually applied by aerial nker. It is supplied by the manufacturer as a powder concentrate, and is prepared for field use by mixing 1.66 pounds er gallon to produce 1.1 gallons of slurry, which is equivalent to 198.93 gram/liter. Retardant use ranges from 0.41 ter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square eter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

ire-Trol LCG-R.

ire-Trol LCG-R is a proprietary mixture of ammonium polyphosphate, attapulgite clay thickener, corrosion inhibitor, ıd iron oxide as a coloring agent to mark aerial drop sites (Chemonics, Inc., Phoenix, AZ). It functions as a long-term re retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness epends on the amount of salt applied per unit surface area. Fire-Trol LCG-R is usually applied by aerial tanker. It is ıpplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate 5 gallons of water to produce 5.39 gallons of slurry, which is equivalent to 1457.25 gram/liter. Retardant use ranges om 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 er/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Phos-Chek D75-F.

Phos-Chek D75-F is a proprietary mixture of ammonium sulfate, ammonium phosphate, guar gum thickener, corrosion in( )tor, and orange coloring agent (F=fugitive coloring agent, i.e., color disappears in 2-3 days after exposure to sun light) (Monsanto, Ontario, CA). It functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Phos-Chef D75-F is usually applied by aerial tanker. It is supplied by the manufacturer as a powder concentrate, and is prepared for field use by mixing 1.2 pounds per gallon to produce 1.069 gallons of slurry, which is equivalent to 143.8 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Phos-Chek WD-881. Phos-Chek WD-881 is a proprietary mixture of anionic surfactants, foam stabilizers, and solvents including hexylene glycol (Monsanto, Ontario, CA). It functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Phos-Chek WD-881 is usually applied by ground operated units mounted on trunks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon per 100 gallon, which is then highly aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Fire-Trol LCA-F

Fire-Trol LCA-F is a proprietary mixture of ammonium polyphosphate, attapulgite clay thickener, corrosion inhibitor, and orange coloring agent to mark aerial drop sites (Chemonics, Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states ammonia and sodium cyanide are hazardous decomposition products. Fire-Trol LCA-F functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Fire-Trol LCA-F is applied by aerial tanker. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 5 gallons of water to produce a slurry, which is equivalent to 287.6 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire-Trol LCM-R

Fire-Trol LCM-R is a proprietary mixture of ammonium polyphosphate, attapulgite clay thickener, corrosion inhibitor, and red coloring agent to mark aerial drop sites (Chemonics, Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states ammonia and sodium cyanide are hazardous decomposition products. Fire-Trol LCM-R functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Fire-Trol LCM-R is applied by aerial tanker. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 4.25 gallons of water to produce a slurry, which is equivalent to 344 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Phos-Chek 259F

Phos-Chek 259F is a proprietary mixture of diammonium phosphate, guar gum thickener, other additives, and reddish coloring agent to mark aerial drop sites (Monsanto Company, Ontario, CA). The Material Safety Data Sheet states ammonia and phosphoric acid (when heated to approximately 200°F [93°C]) are hazardous decomposition products. Phos-Chek 259F functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Phos-Chek 259F is applied by aerial tanker. It is supplied by the manufacturer as a powder, and is prepared for field use by mixing 1.14 pounds per 1 gallon of water to produce a slurry, which is equivalent to 136.6 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44

iter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire-Trol FireFoam 103B

Fire-Trol FireFoam 103B is a proprietary mixture of anionic surfactants, foam stabilizers, and inhibiting agent hexylene glycol) (Chemonics Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states that there are no hazardous decomposition products. Fire-Trol FireFoam 103B functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire-Trol FireFoam 103B is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Fire-Trol FireFoam 104

Fire-Trol FireFoam 104 is a proprietary mixture of anionic surfactants, foam stabilizers, inhibitors, and solvents hexylene glycol, n-butyl alcohol, and butanol) (Chemonics Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states that there are no hazardous decomposition products. Fire-Trol FireFoam 104 functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire-Trol FireFoam 104 is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Fire Quench

Fire Quench is a proprietary mixture of anionic surfactants, foam stabilizers, inhibitors, and solvents (Texas Department of Corrections, Sugarland, TX). The Material Safety Data Sheet states that some oxides of sulfur are hazardous decomposition products. Fire Quench functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. This formulation also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire Quench is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

ForExpan S

ForExpan S is a proprietary mixture of ammonium deceth 2,2 sulfate, 2(2-butoxyethoxy) ethanol, ethanol, sodium myriteth 3 sulfate, myriteth-3, and 1-dodecanol (Angus FireArmourLtd., Toronto, Ontario). The Material Safety Data Sheet states that some oxides of sulfur and nitrogen are hazardous decomposition products. ForExpan S functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. This formulation also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. ForExpan S is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Pyrocap B-136

Pyrocap B-136 is a proprietary mixture of anionic surfactants, foam stabilizers, and other additives (Pyrocap Inc., Springfield, VA). The Material Safety Data Sheet gives no information about hazardous decomposition products. Pyrocap B-136 functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, th( )educing the ability of the fuel to ignite. This formulation also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Pyrocap B-136 is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

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Northern Prairie Wildlife Research Center

March 31, 2000

Karen Terrill
nformation Officer
916) 653-5123

CDF Joins Federal Agencies in Banning Use of Certain Fire Retardant Products

SACRAMENTO - The California Department of Forestry and Fire Protection (CDF) has suspended use of certain fire retardant chemicals which have been shown to release unacceptable levels of cyanide into the environment.

The CDF purchases its retardant from the USDA Forest Service. The Forest Service announced this week the results of a new study ("The Effects of UVB Radiation on the Toxicity of Fire Fighting Chemicals") which identified a particular type of retardant that poses a threat to aquatic wildlife under certain conditions.

The retardant, produced and distributed by FIRE-TROL Holdings, L.L.C., includes a corrosion inhibitor (to protect airplane tanks) which when combined with the colorant in the retardant and exposed to sunlight and water, creates ferrous cyanide as a by-product. The new information indicates that when this particular fire retardant is accidentally dropped into surface water, the level of cyanide that results could be in violation of EPA standards.

"When the U.S. Forest Service informed us of the extent to which cyanide is present in this product, we took immediate action to stop any further use of this product," said Jim Wright, Assistant Deputy Director for Fire Protection. "Because CDF avoids dropping retardant in or around water, chance of any harmful impact are slight".

The CDF is currently exploring other sources for retardant supplies for the coming fire season.

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- For monthly reports, submit monitoring results, without the lab reports, and an instrument calibration log, and explain whether wastewater was discharged to the spray disposal field during that month or any of the limitations were violated.
- For quarterly reports, submit monitoring results, report groundwater elevations, calculate groundwater flow gradient, compare monitoring results to applicable limitations, and generate a groundwater elevation contour map.
- Annual report to be submitted by February 1st that provides summary of monitoring data obtained the previous year, and any discussion of corrective actions taken or planned to keep discharge in compliance.

Term of Permit

No permit expiration date.

Fighting Fire From The Air

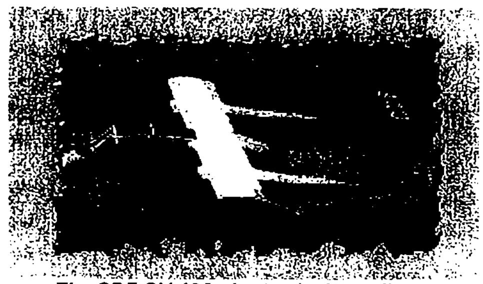
SEE:
- S-2T Airtanker
- S-2A Airtanker
- UH-1H Super Huey Helicopters
- OV-10A
- Short Haul Rescue
- Federal Excess Property
- Modular Airborne Fire Fighting System

= ADOBE = WORD = HTML

In support of its ground forces, the CDF 2003 emergency response air program includes 16 Grumman S-2T 1,200 gallon airtankers, 7 Grumman S-2A 800 gallon airtankers, 9 UH-1H Super Huey helicopters, and 13 OV-10A air attack aircraft. From 13 air attack and nine helitack bases located statewide, aircraft can reach most fires within 20 minutes.

The air attack planes fly overhead directing the airtankers and helicopters to critical areas of the fire for retardant and water drops. The retardant used to slow or retard the spread of a fire is a slurry mix consisting of a chemical salt compound, water, clay or a gum-thickening agent, and a coloring agent. At nine pounds per gallon an S-2A can carry 7,200 pounds. The S-2T can carry 10,800 pounds.

While both airtankers and helicopters are equipped to carry fire retardant or water, the helicopters can also transport firefighters, equipment and injured personnel. All CDF Aircraft are strategically located throughout the state at airbases and helicopter bases. During high fire activity, CDF may move aircraft to better provide statewide air support.



The CDF OV-10A air attack plane allows personnel to direct air operations from above an incident.

The average annual budget of the CDF Aviation Management Program is nearly $20 million. A total of 18 CDF personnel oversee the program with an additional 130 contract employees providing mechanical, pilot and management services to the program.

CDF's current contractor is DynCorp. They provide airtanker and air attack plane maintenance and pilots, as well as helicopter maintenance. All CDF helicopters are flown by CDF pilots.

CDF is in the middle of an air modernization program that retrofits S-2E/G aircraft, which are larger than their S-2A predecessors, with turboprop engines and 1,200 gallon retardant tanks. Sixteen of these new S-2T airtankers will be in service during the 2003 Fire Season.

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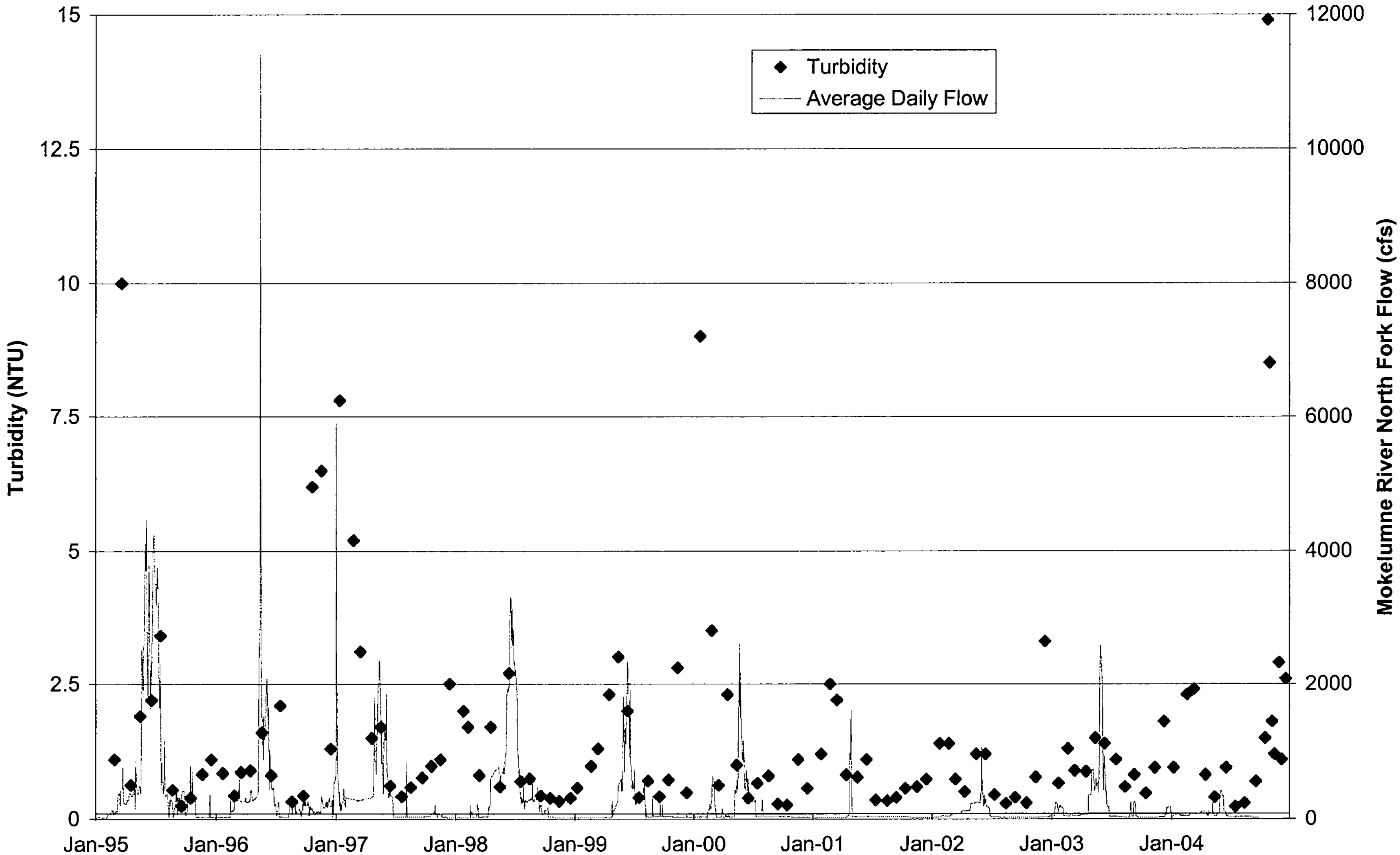
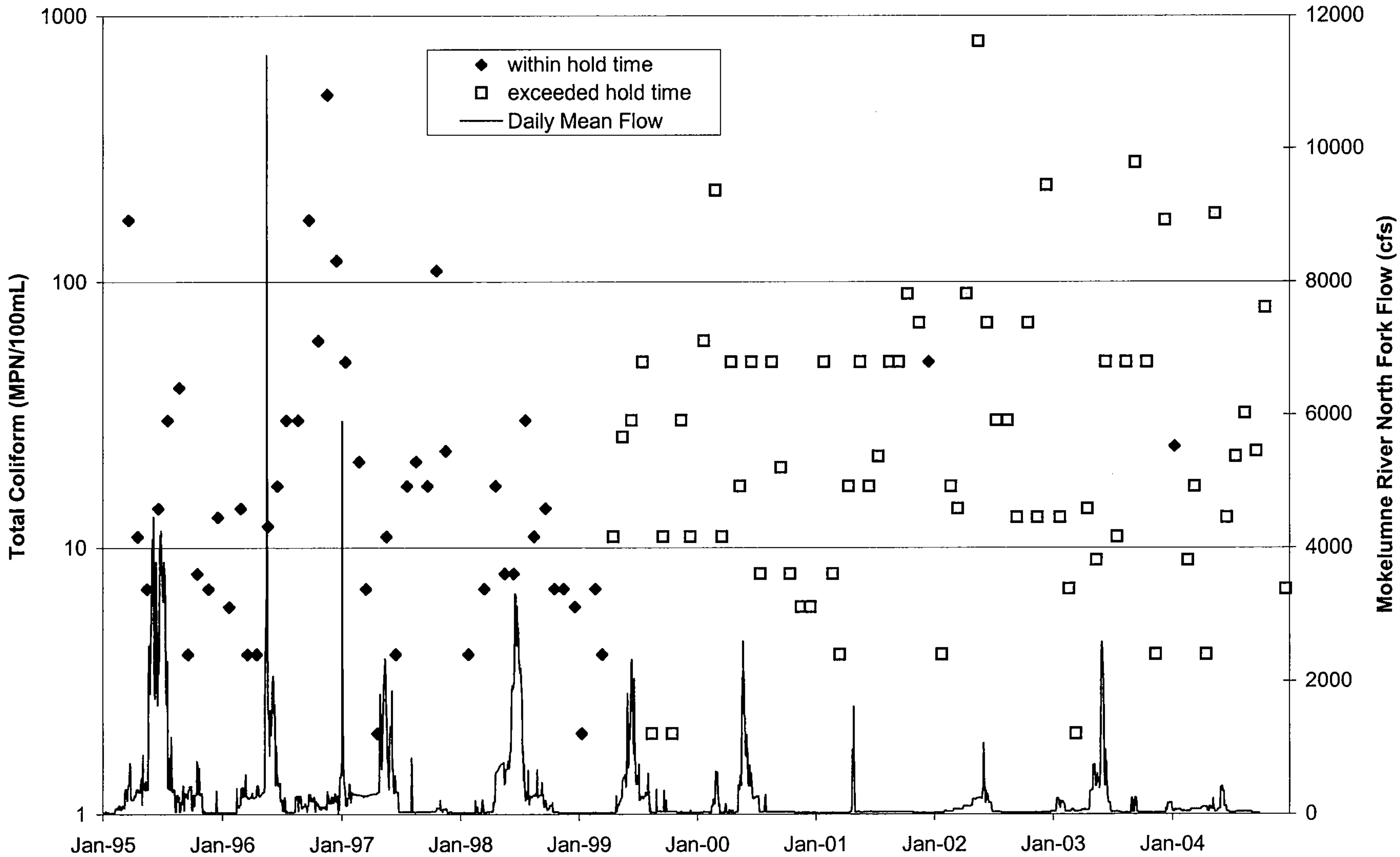
APPENDIX F

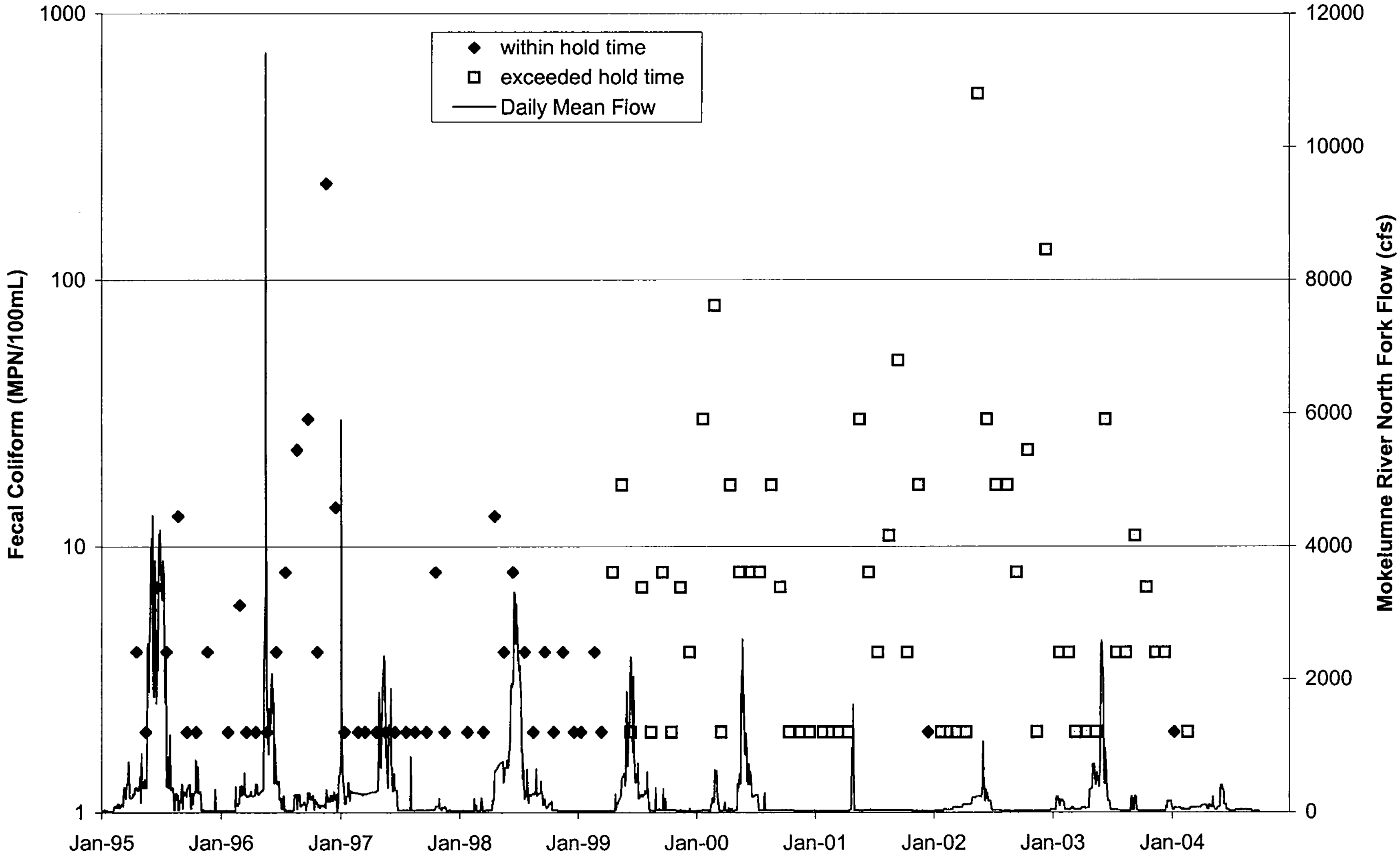
North Fork Mokelumne River Turbidity Monitoring -- MRTC



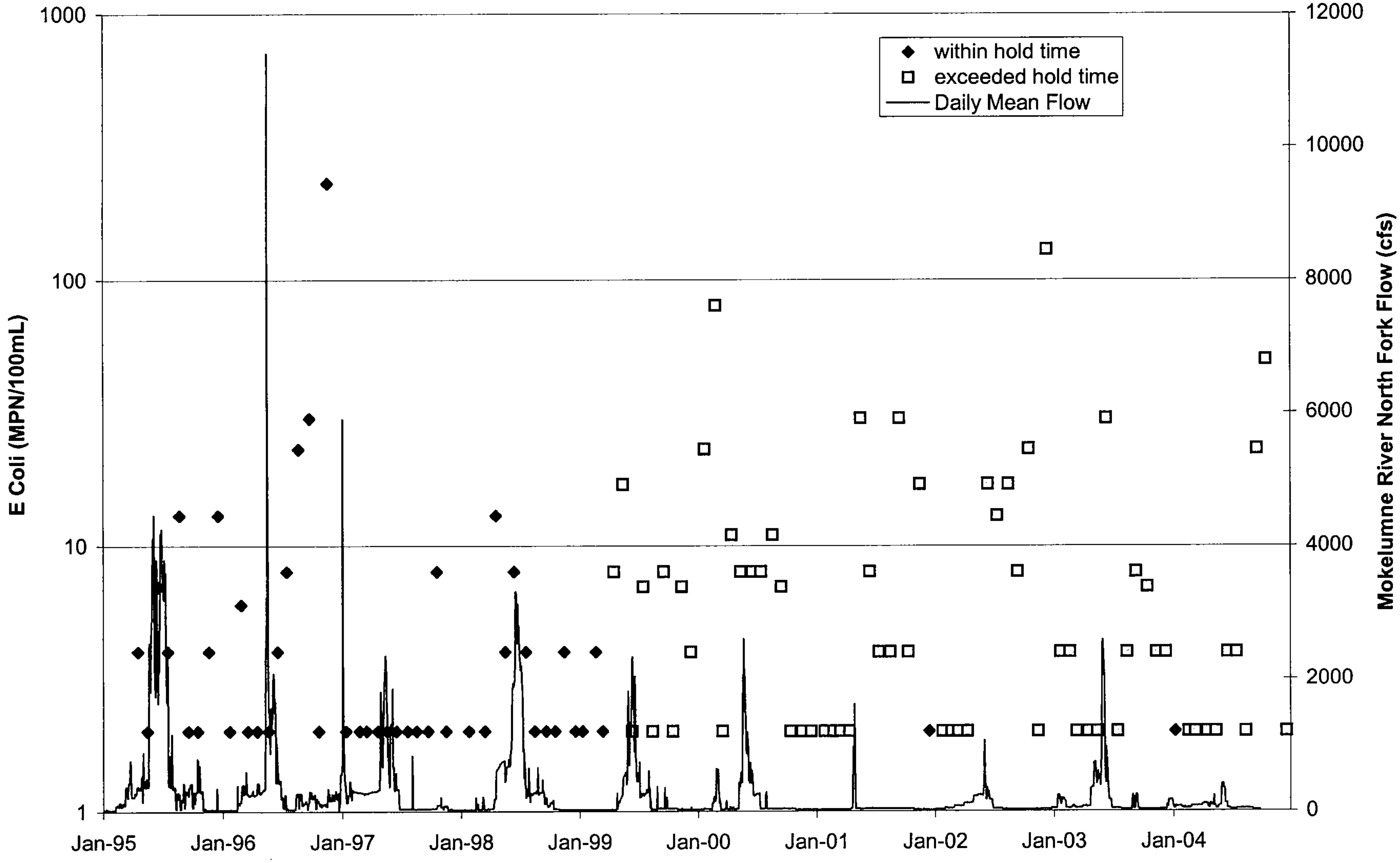
North Fork Mokelumne River Total Coliform Monitoring -- MRTC



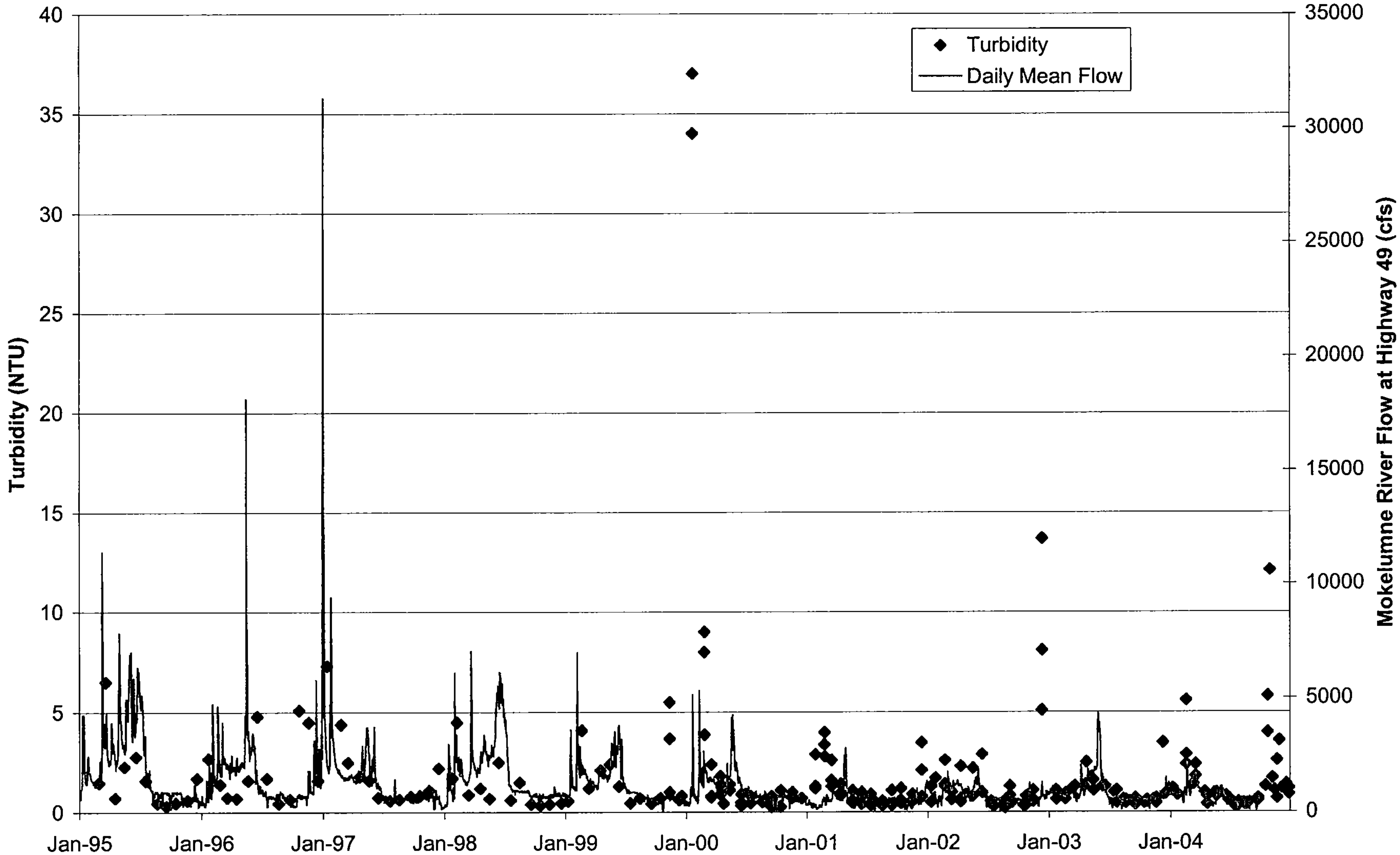
North Fork Mokelumne River Fecal Coliform Monitoring -- MRTC



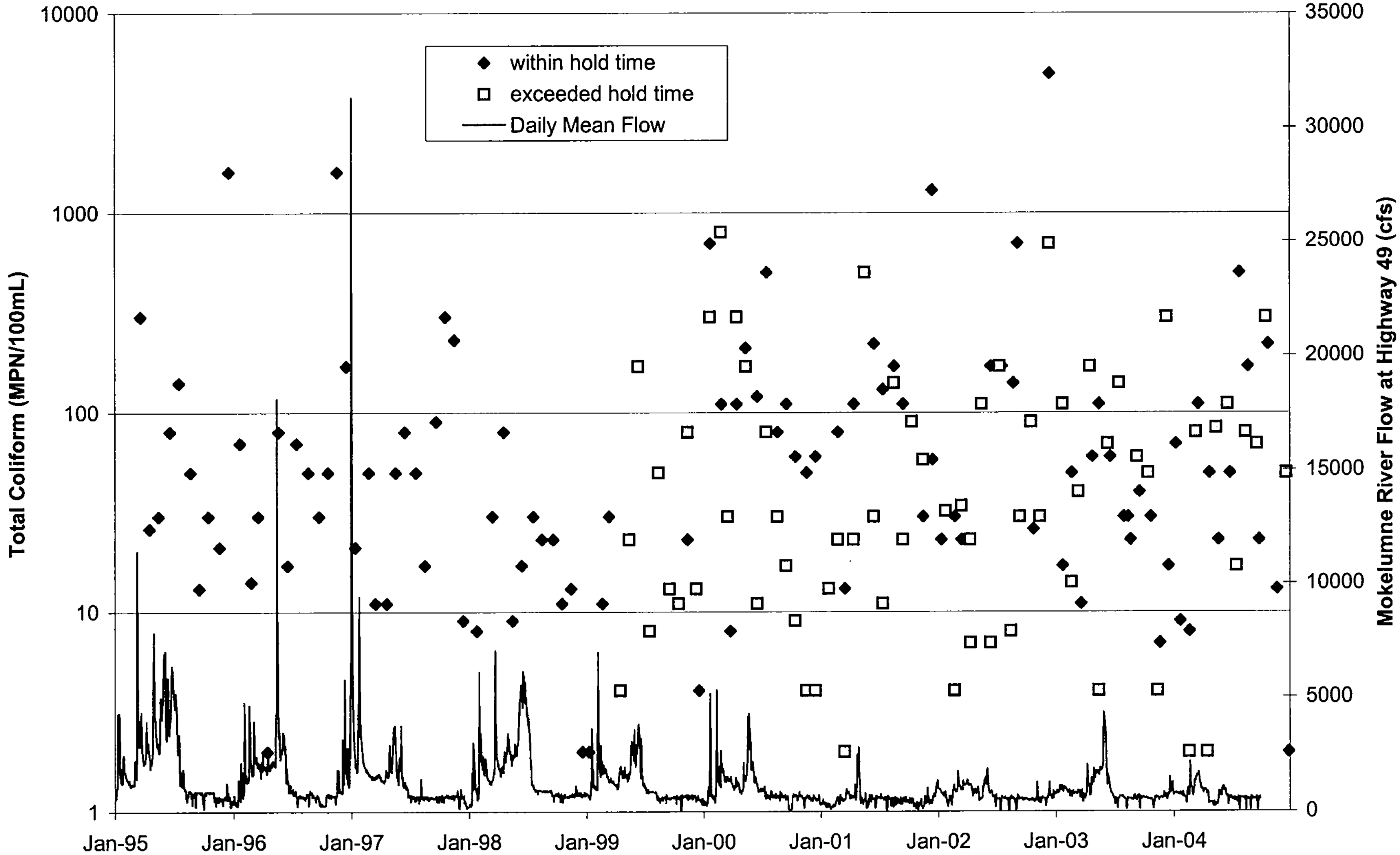
North Fork Mokelumne River E Coli Monitoring -- MRTC



Mokelumne River Turbidity Monitoring -- Highway 49



Mokelumne River Total Coliform Monitoring -- Highway 49



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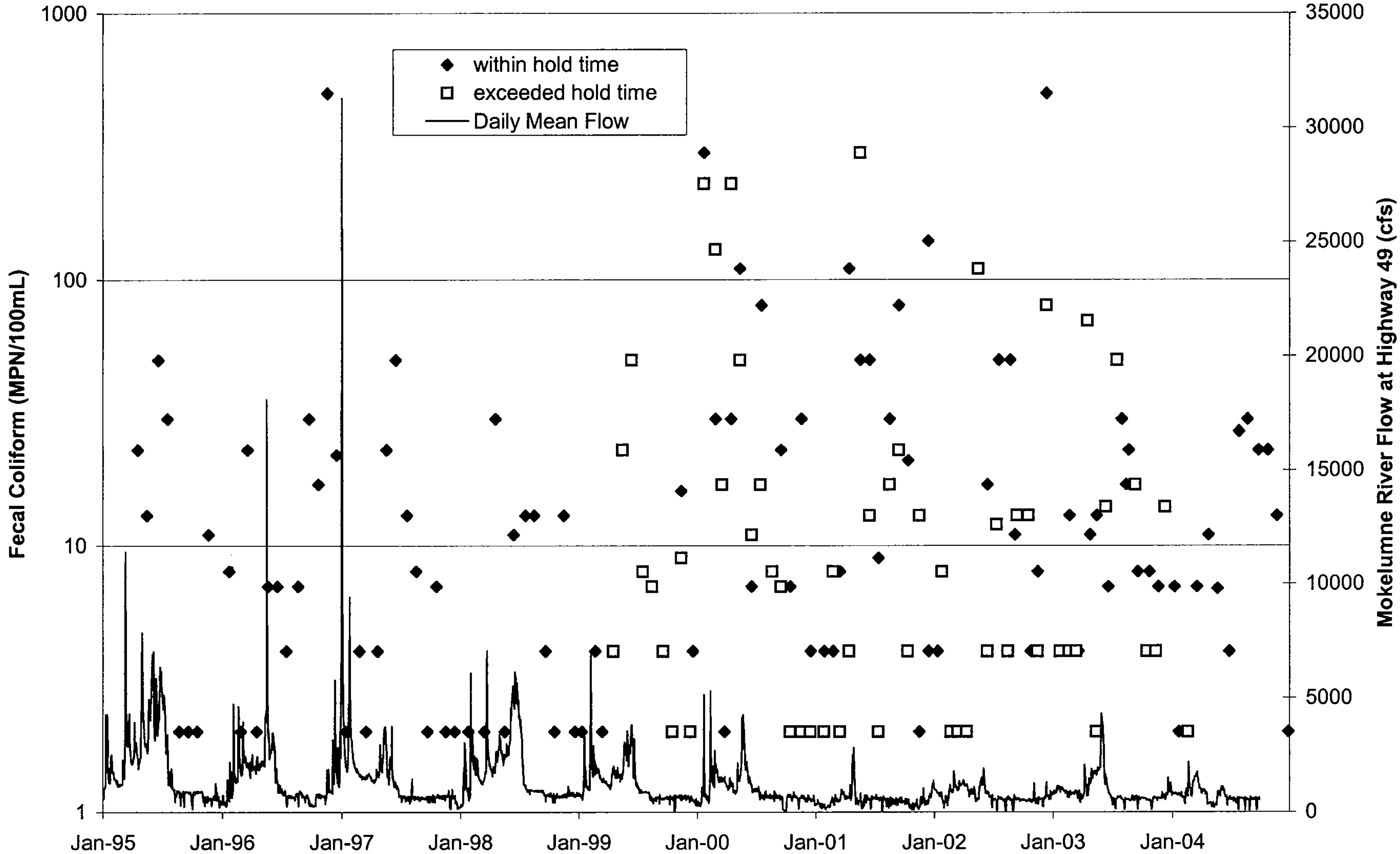
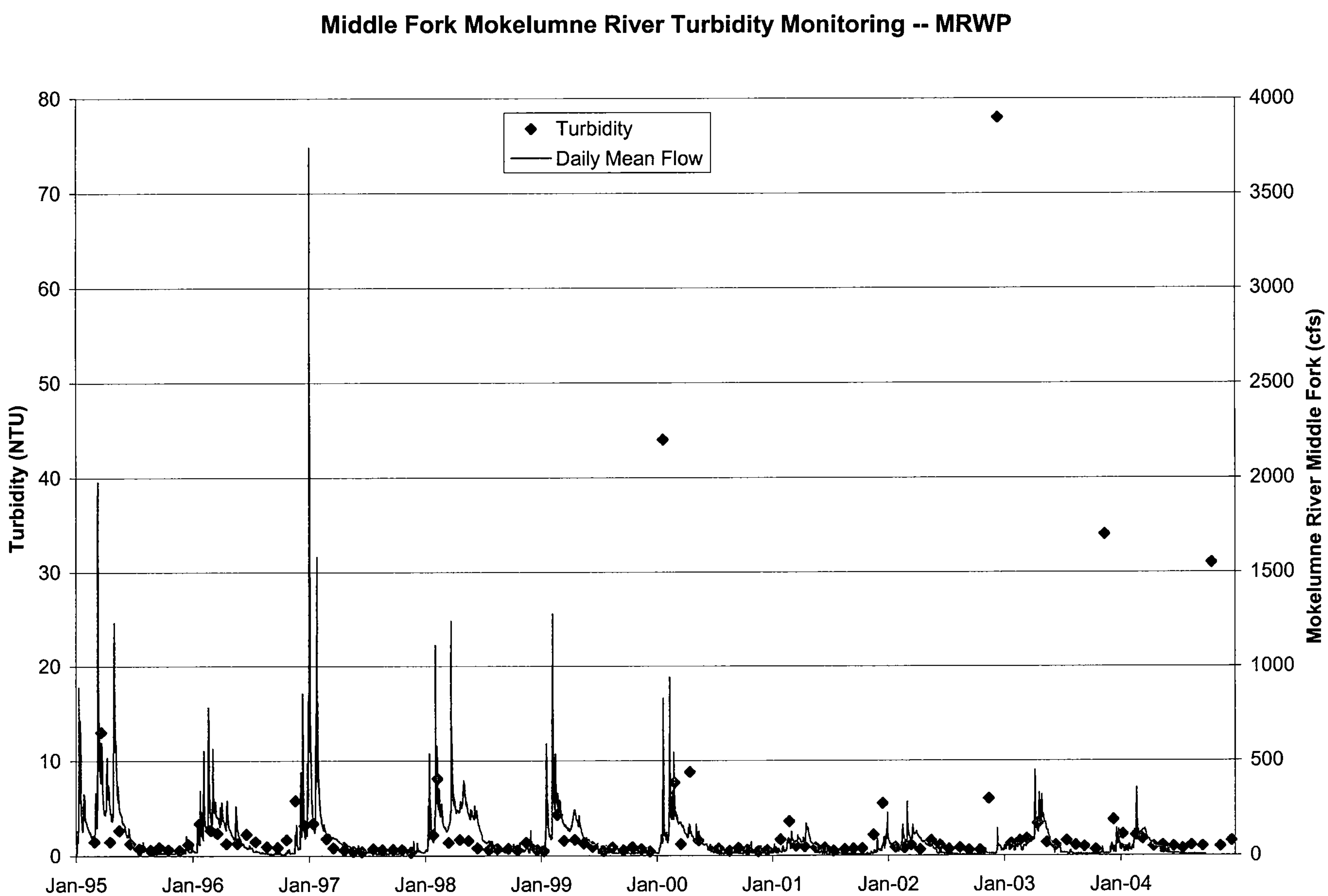
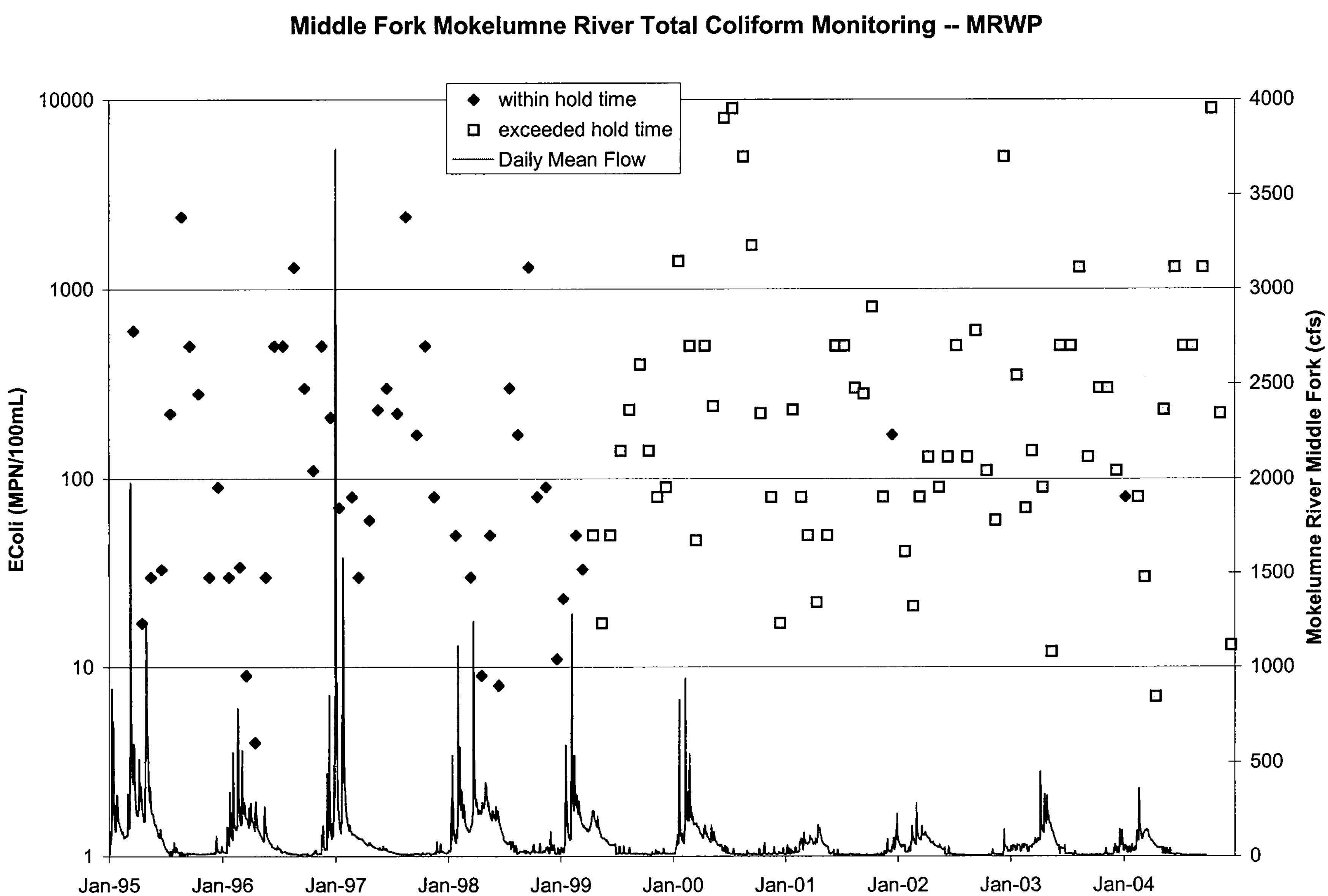
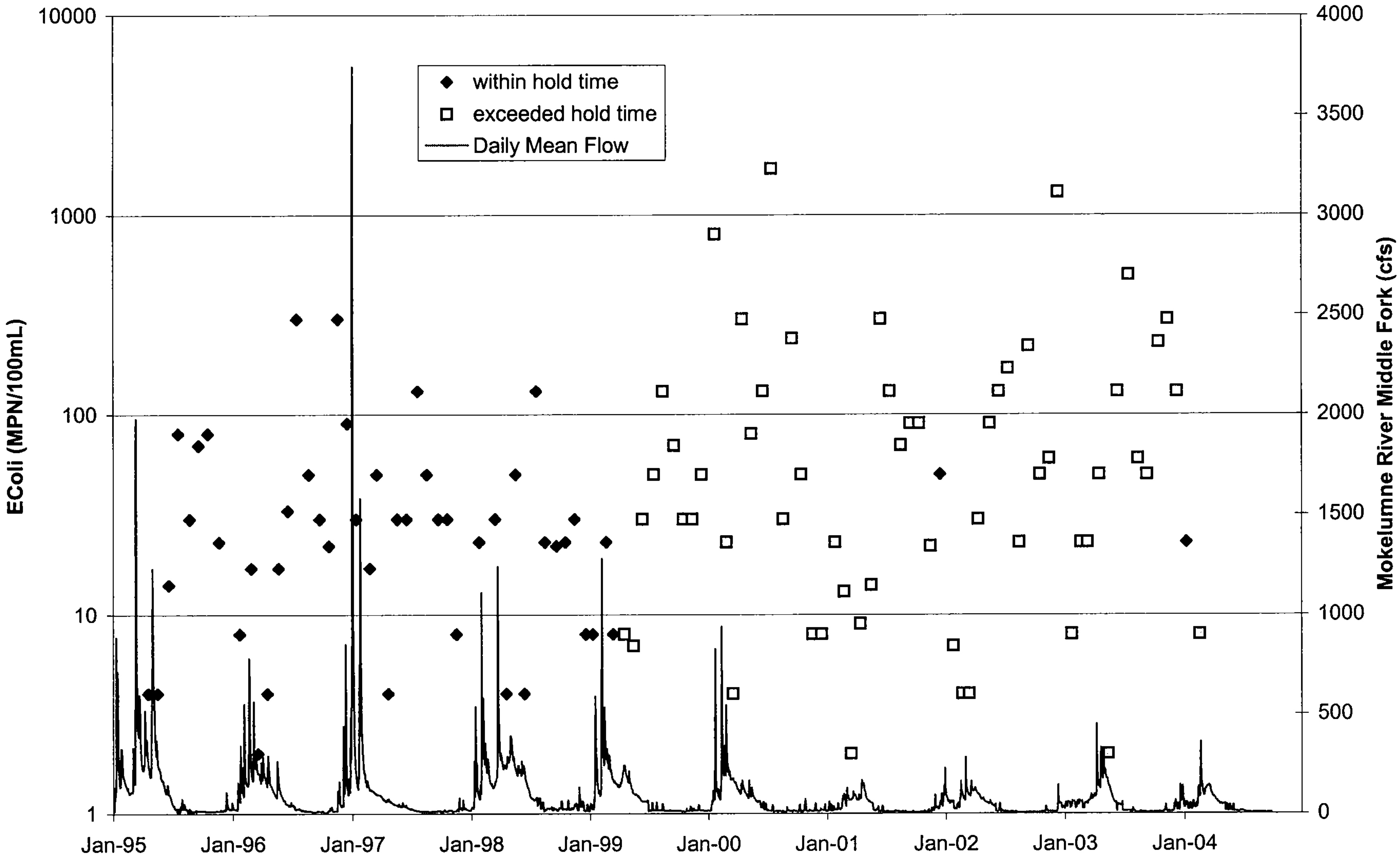




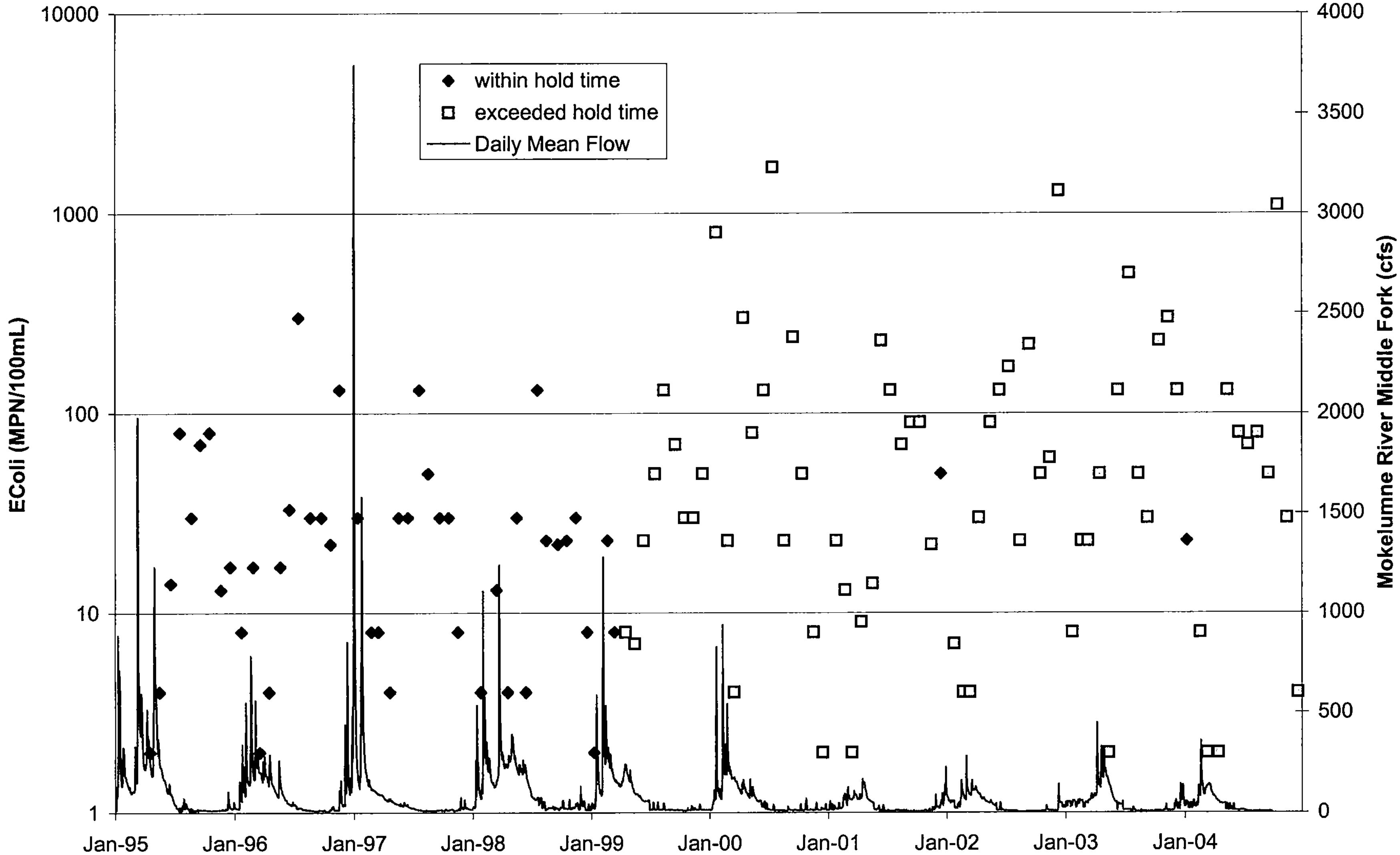
Middle Fork Mokelumne River Turbidity Monitoring -- MRWP
Turbidity
Daily Mean Flow
Turbidity (NTU)
Mokelumne River Middle Fork (cfs)
0
10
20
30
40
50
60
70
80
500
1000
1500
2000
2500
3000
3500
4000
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04


Middle Fork Mokelumne River Total Coliform Monitoring -- MRWP
within hold time
exceeded hold time
Daily Mean Flow
EColi (MPN/100mL)
Mokelumne River Middle Fork (cfs)
10000
1000
100
10
1
4000
3500
3000
2500
2000
1500
1000
500
0
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04

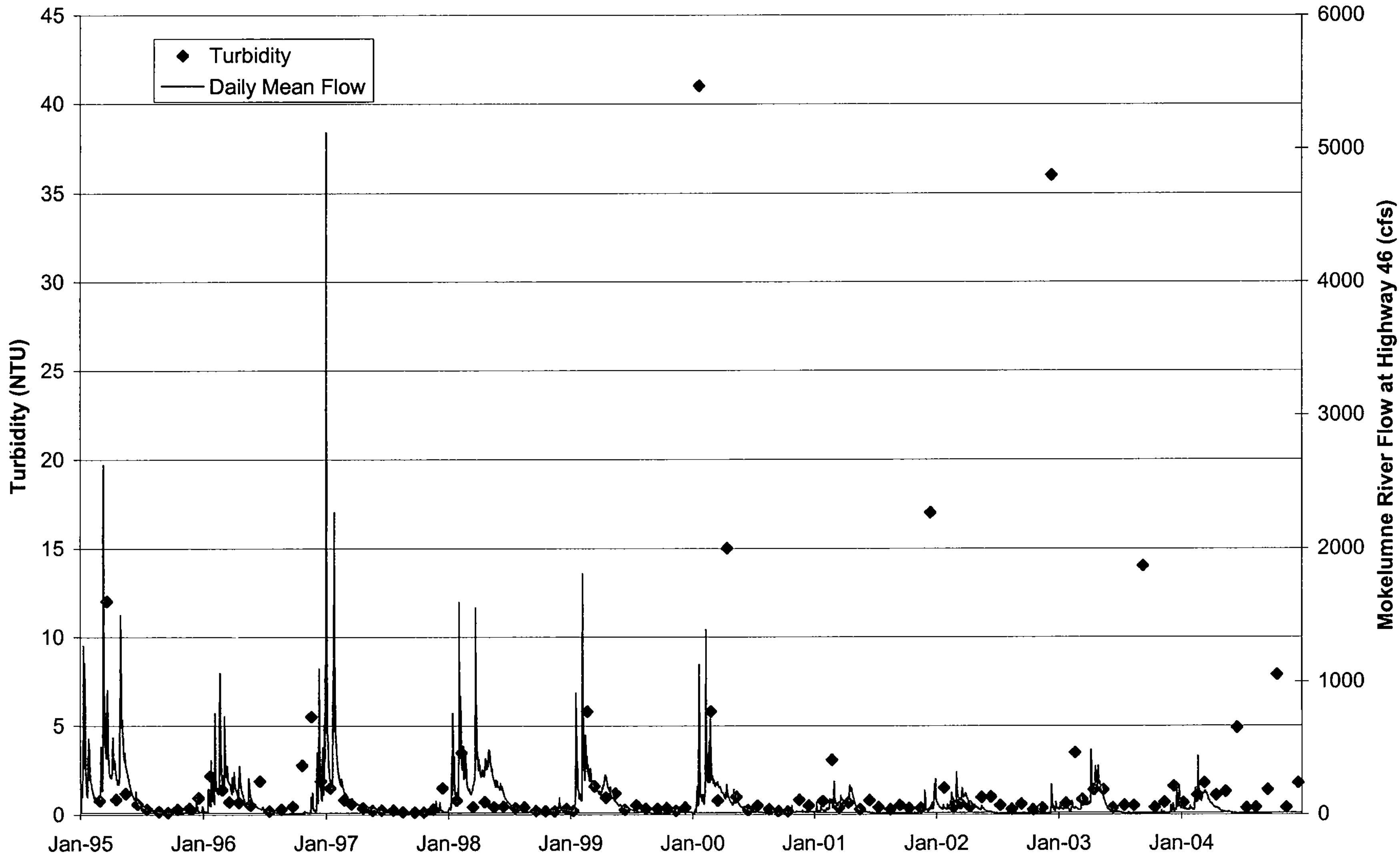
Middle Fork Mokelumne River Fecal Coliform Monitoring -- MRWP

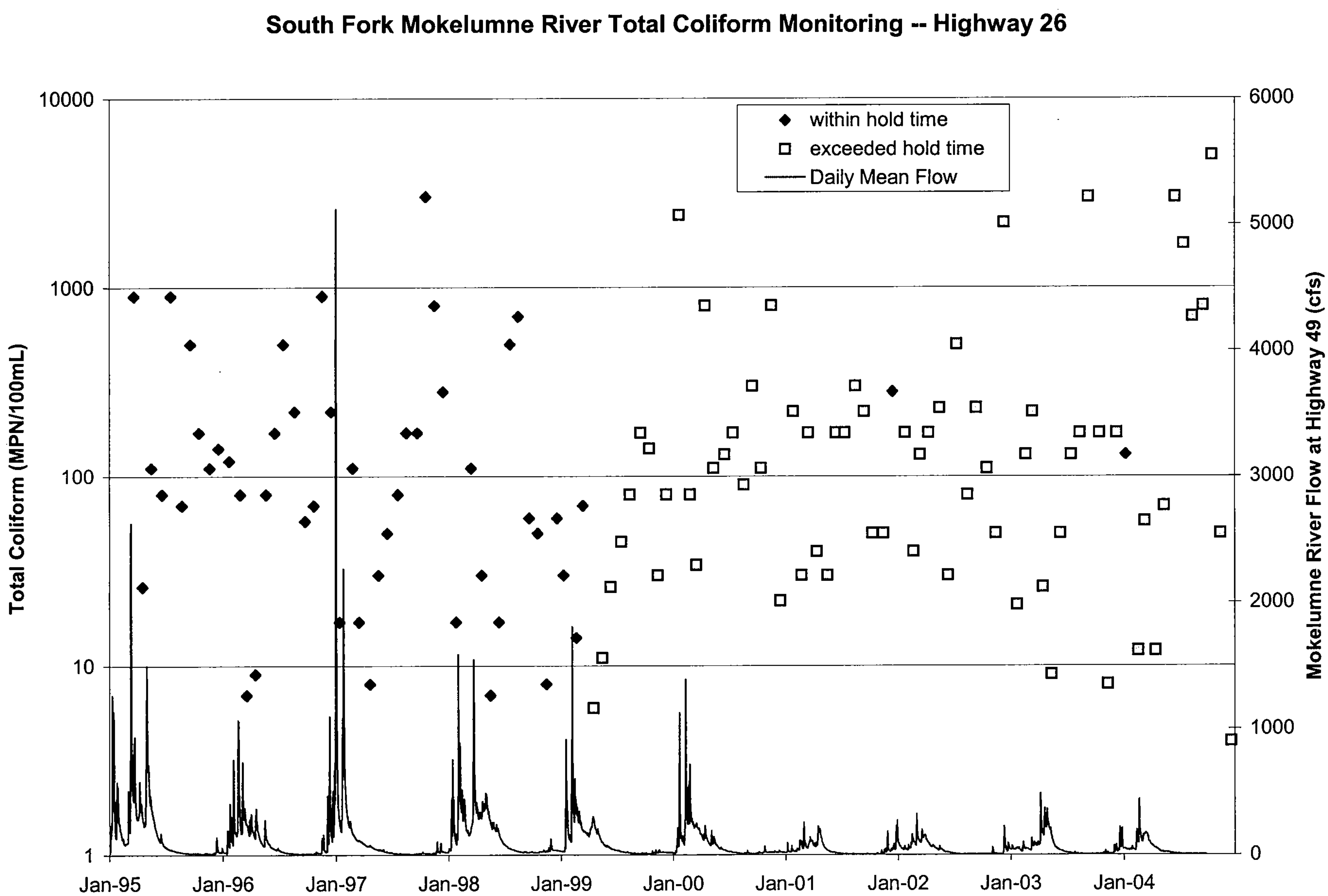


Middle Fork Mokelumne River EColi Monitoring -- MRWP

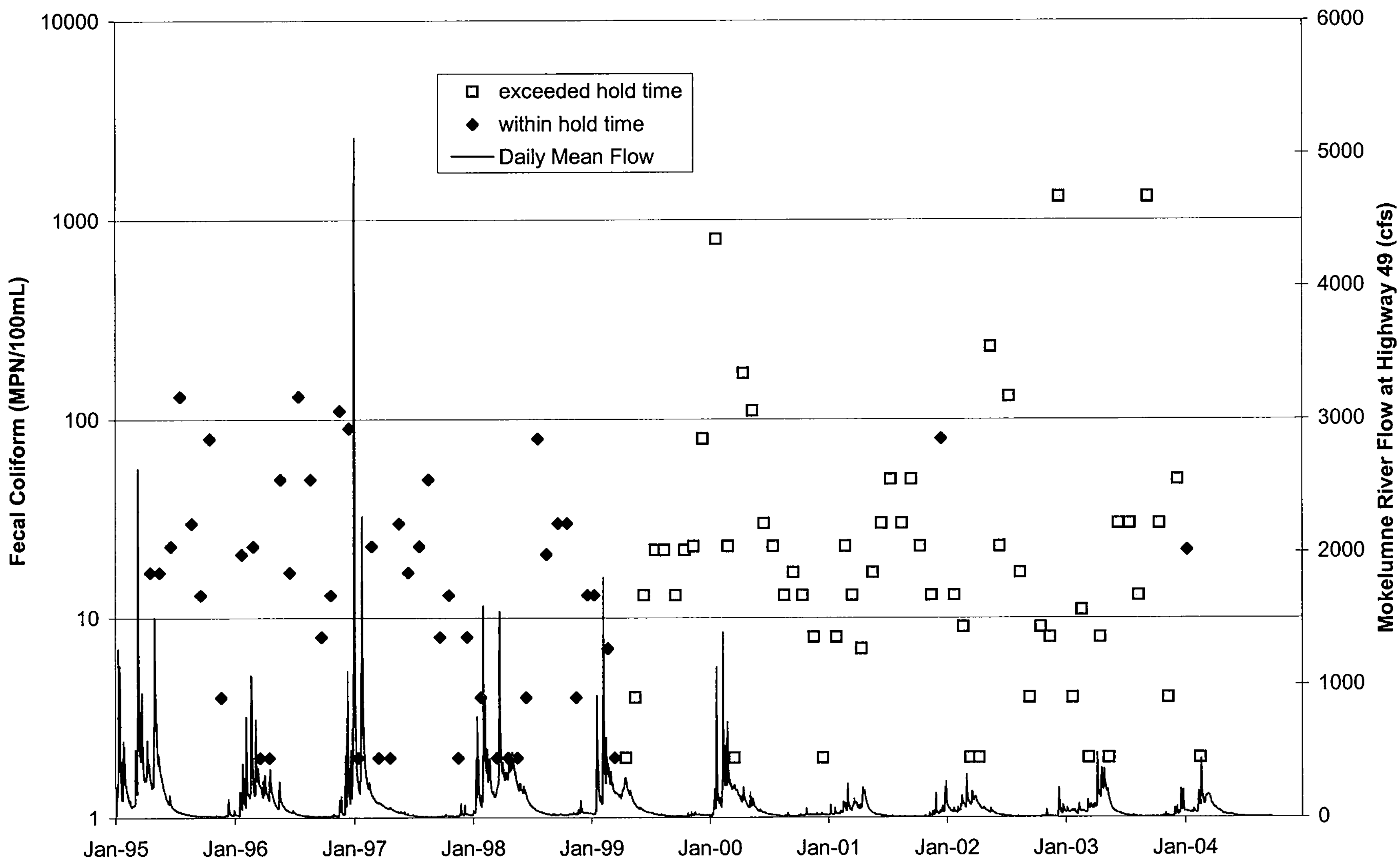


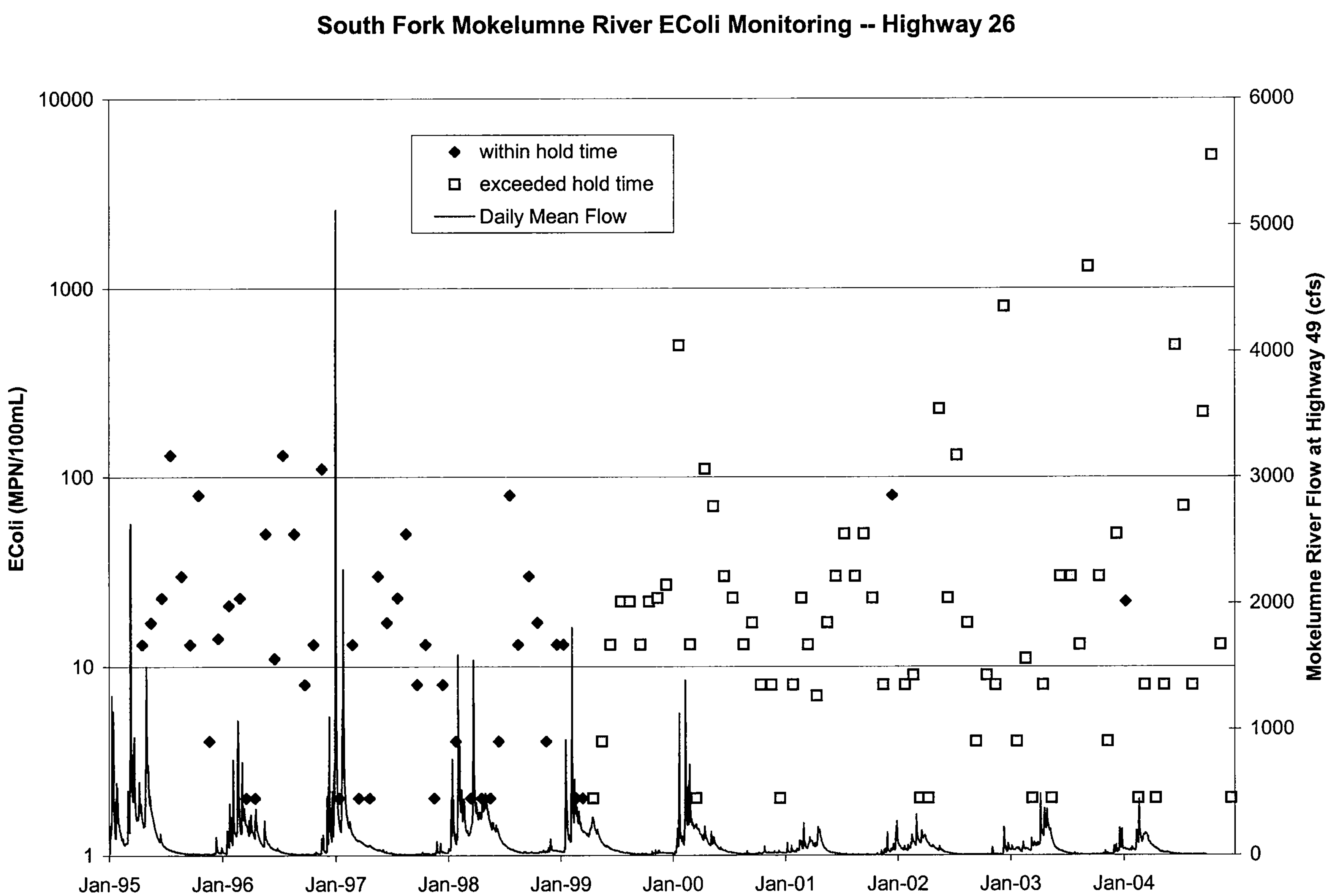
South Fork Mokelumne River Turbidity Monitoring -- Highway 26




South Fork Mokelumne River Total Coliform Monitoring -- Highway 26
within hold time
exceeded hold time
Daily Mean Flow
Total Coliform (MPN/100mL)
Mokelumne River Flow at Highway 49 (cfs)
10000
1000
100
10
1
6000
5000
4000
3000
2000
1000
0
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04

South Fork Mokelumne River Fecal Coliform Monitoring -- Highway 26




South Fork Mokelumne River EColi Monitoring -- Highway 26
within hold time
exceeded hold time
Daily Mean Flow
EColi (MPN/100mL)
Mokelumne River Flow at Highway 49 (cfs)
10000
1000
100
10
1
6000
5000
4000
3000
2000
1000
0
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04

APPENDIX G

LIST OF ACRONYMS
USED IN THE
MOKELUMNE RIVER WATERSHED
SANITARY SURVEY

2005 Sanitary Survey
Acronym List

ACCWP	Alameda Countywide Clean Water Program
ACRCD	Alameda County Resource Conservation District
AGP	Annual Grazing Plans
AIC	Area Incident Command
AMP	Allotment Management Plans
AUMs	Animal Unit Months
AWA	Amador Water Agency
AWAG	Amador Weed Advisory Group
AWWA	American Water Works Association
Basin Plan	Water Quality Control Plan
BART	Bay Area Rapid Transit District
BLM	Bureau of Land Management
BMP	Business Management Practices
BOD5	Biological Oxygen Demand - 5 days
Caltrans	California Department of Transportation
CAWP	Central Amador Water Project
CCCSD	Contra Costa County Sanitary District
CCCWP	Contra Costa Clean Water Program
CCL	Candidate Contaminant List
CCRs	Consumer Confidence Reports
CCTV	Closed Circuit Television
CCWD	Calaveras County Water District
CDC	California Department of Corrections
CDF	California Department of Forestry and Fire Protection
CDFG	California Department of Fish and Game
CDHS	California Department of Health
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNDD	California Natural Diversity Database
COE	U.S. Army Corps of Engineers'
CPUD	Calaveras Public Utility District
CRMA	Coordinated Resource Management Areas
CSIP	Capital Security Improvement Projects
CYA	California Youth Authority
D/DBP	Disinfectant/Disinfection By-Product
Department	Calaveras County Environmental Health Department

2005 Sanitary Survey
Acronym List

District	East Bay Municipal Utility District
DLRs	Detection Limts for Reporting
DOC	Dissolved Organic Carbon
DTSC	Department of Toxic Control
DWCCL	Drinking Water Candidate Contaminant Lists
EBHCP	East Bay Habitat Conservation Plant
EBMUD	East Bay Municipal Utility District
EBRPD	East Bay Regional Park District
EBWMP	East Bay Watershed Master Plan
EBWSS	East Bay Watershed Sanitary Survey
EDB	Ethylene Dibromide
EIR	Environmental Impact Report
EOC	Emergency Operations Center
EOT	Emergency Operations team
ER Plan	Emergency Response Plan
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFMP	Fire and Fuels Management Program
Fish and Game	California Department of Fish and Game
FMP	Fire Management Plan
FMU	Fire Management Units
FOC	Field Operations Centers
FRAP	Fire and Resource Assessment Program
FRPP	Fire Response Preparedness Plan
GHAD	Geological Hazard Abatement District
GIS	Geographic Information Systems
GWDR	Ground Water Disinfection Rule
GWR	Ground Water Rule
GWUDI	Ground Water Under Direct Influence
HAA	Haloacetic Acid
HCP	Habitat Conservation Plan
HOS	Hypolimnetic Oxygenation System
HPC	Heterotrophic Plate Count
HRMP	Habitat Restoration and Management Plan
ICR	Information Collection Rule
ICS	Incident Command System
IDSE	Individual Distribution System Evaluation
IESWTR	Interim Enhanced Surface Water Treatment Rule

IOC	Inorganic Compound
IPM	Integrated Pest Management
ITP	Incidental Take Permit
IVM	Integrated Vegetation Management
JSA	Joint Settlement Agreement
JVID	Jackson Valley Irrigation District
LRMP	Land and Resource Management Plan
LT1ESWTR	Long Term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR	Long Term 2 Enhanced Surface Water Treatment Rule
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDL	Minimum/maximum Detection Level
MEP.	Maximum Extent Practicable
MGD	Million Gallons per Day
mg/L	milligrams per liter
MIB	Methylisoborneol
mL	milliliter
MMM	Multimedia Mitigation Program
MPN	Most Probable Number
MRDL	Maximum Residual Disinfectant Levels
MRDLG	Maximum Residual Disinfectant Levels Goals
MRWPA	Mokelumne River Water and Power Authority
MRWSS	Mokelumne River Watershed Sanitary Survey
MSL	Mean Sea Level
MTBE	Methyl Tertiary-butyl Ether
NAS	National Academy of Science
NIMS	National Incident Management System
NOAA	National Organic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	Non-Point Source
NRP	National Response Plan
NTU	Nephelolometric Turbidity Units
O&M	Operations and Maintenance Department
OCC	Operation Control Center
OES	Office of Emergency Services
OHV	Off-highway Vehicle
OWTS	On-site Waste Treatment System

2005 Sanitary Survey
Acronym List

PACs	Protected Activity Centers
PACl	Polyaluminum Chloride
PA/ED	Project Assessment/Environmental Document
PCBs	Polychlorinated Biphenyls
pCi/L	picoCuries per liter
PG&E	Pacific Gas & Electric
PID	Project Initiation Document
PS&E	Plans, Specification and Estimates
RCAs	Riparian Conservation Areas
RDM	Residual Dry Matter
Regional Board	Central Valley Regional Water Quality Control Board
ROD	Record of Decision
RPU	Resource Patrol Units
RRMP	Range Resource Management Plan
RWQCB	Regional Water Quality Control Board
SDWA	Safe Drinking Water Act
SEMS.	State Emergency Management Systems
SFR	Single Family Residential
SIP	Seismic Improvement Program
SMCL	Secondary Maximum Contaminant Level
SNFPA	Sierra National Forest Plan Amendment
SOC	Synthetic (Non-Volatile) Organic Compound
SOCC	Security Operations Control Center
SPI	Sierra Pacific Industries
SPR	San Pablo Reservoir
SSP	Special Status Species
STAGE 1 –DBPR	Disinfection By Product Rule
STAGE 2 – DBPR	Disinfection By Product Rule
SWMP	Statewide Storm Water Management Program
SWAT	Storm Water Advisory Teams
SWDR	Storm Water Data Report
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
SWTR	Surface Water Treatment Rule
T&O	Taste and Odor
TAF	Thousand acre feet
TCR	Total Coliform Rule
TDS	Total Dissolved Solids
THM	Trihalomethanes
THPs	Timber Harvest Plans

TNF	True Natural Flow
TOC	Total Organic Carbon
TON	Threshold Odor Number
TPZ	Timberland Production Zone
TSS	Total Suspended Solids
TTHMs	Total Trihalomethanes
T&O	Taste and Odor
UCMR 1	Unregulated Contaminant Monitoring Rule- List 1
UMRWA	Upper Mokelumne River Watershed Authority
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USL	Upper San Leandro
USEPA	United States Environmental Protection Agency
USTs	Underground Storage Tanks
VA	Vulnerability Assessment
VOC	Volatile Organic Chemicals
WAM	Watershed Assessment and Monitoring
WPCP	Water Pollution Control Plan
WQ	Water Quality
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WUI	Wildland Urban Interface

Ecological Effects of Fire Retardant
Chemicals and Fire Suppressant Foams
Description of Chemicals

Phos Chek G75F.
Phos-Chek G75-F is a proprietary formulation composed of monoammonium phosphate and ammonium sulfate, fugitive coloring agent, and small amounts of gum-thickener, bactericide, and corrosion inhibitor (National Wildfire Coordinating Group, Fire Equipment Working Team 1991). Phos-Chek is typically applied from helicopter bucket or ground tanker in advance of a fire; other retardants with higher viscosity are applied from fixed-wing aircraft. The ammonium salts retard fire by chemically combining with cellulose as fuels are heated, as well as through evaporative cooling of the fuels. Phos-Chek is supplied by the manufacturer as a powder, which is mixed with water to the desired concentration before application.

Silv-Ex.
Silv-Ex concentrate is a proprietary mixture of sodium and ammonium salts of fatty alcohol ether sulfates, higher alcohols, and water, as well as butyl carbitol and ethyl alcohol (Ansul, Incorporated 1994). It functions as a surfactant (i.e. detergent), allowing water to penetrate and expand over the surface of fuels to both cool and smother the fire. Silv-Ex, like other Class A foams, is applied operationally either from ground tankers or helicopters. Silv-Ex is supplied by the manufacturer as a liquid concentrate, which is mixed with water to the desired concentration before application.

Fire-Trol GTS-R.
Fire-Trol GTS-R is a proprietary mixture of ammonium sulfate, diammonium phosphate, guar gum thickener, spoilage inhibitor, corrosion inhibitor, and iron oxide as a coloring agent to mark aerial drop sites (Chemonics, Inc., Phoenix, AZ). It functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount r unit surface area. Fire-Trol GTS-R is usually applied by aerial tanker. It is supplied by the manufacturer as a powder concentrate, and is prepared for field use by mixing 1.66 pounds per gallon to produce 1.1 gallons of slurry, which is equivalent to 198.93 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire-Trol LCG-R.
Fire-Trol LCG-R is a proprietary mixture of ammonium polyphosphate, attapulgite clay thickener, corrosion inhibitor, and iron oxide as a coloring agent to mark aerial drop sites (Chemonics, Inc., Phoenix, AZ). It functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Fire-Trol LCG-R is usually applied by aerial tanker. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 4.5 gallons of water to produce 5.39 gallons of slurry, which is equivalent to 1457.25 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Phos-Chek D75-F.
Phos-Chek D75-F is a proprietary mixture of ammonium sulfate, ammonium phosphate, guar gum thickener, corrosion inhibitor, and orange coloring agent (F=fugitive coloring agent, i.e., color disappears in 2-3 days after exposure to sun light) (Monsanto, Ontario, CA). It functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Phos-Chef D75-F is usually applied by aerial tanker. It is supplied by the manufacturer as a powder concentrate, and is prepared for field use by mixing 1.2 pounds per gallon to produce 1.069 gallons of slurry, which is equivalent to 143.8 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Phos-Chek WD-881.
Phos-Chek WD-881 is a proprietary mixture of anionic surfactants, foam stabilizers, and solvents including hexylene glycol (Monsanto, Ontario, CA). It functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Phos-Chek WD-881 is usually applied by ground operated units mounted on trunks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon per 100 gallon, which is then highly aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Fire-Trol LCA-F
Fire-Trol LCA-F is a proprietary mixture of ammonium polyphosphate, attapulgite clay thickener, corrosion inhibitor, and orange coloring agent to mark aerial drop sites (Chemonics, Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states ammonia and sodium cyanide are hazardous decomposition products. Fire-Trol LCA-F functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Fire-Trol LCA-F is applied by aerial tanker. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 5 gallons of water to produce a slurry, which is equivalent to 287.6 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire-Trol LCM-R
Fire-Trol LCM-R is a proprietary mixture of ammonium polyphosphate, attapulgite clay thickener, corrosion inhibitor, and red coloring agent to mark aerial drop sites (Chemonics, Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states ammonia and sodium cyanide are hazardous decomposition products. Fire-Trol LCM-R functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Fire-Trol LCM-R is applied by aerial tanker. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 4.25 gallons of water to produce a slurry, which is equivalent to 344 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100

square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Phos-Chek 259F

Phos-Chek 259F is a proprietary mixture of diammonium phosphate, guar gum thickener, other additives, and reddish coloring agent to mark aerial drop sites (Monsanto Company, Ontario, CA). The Material Safety Data Sheet states ammonia and phosphoric acid (when heated to approximately 200°F [93°C]) are hazardous decomposition products. Phos-Chek 259F functions as a long-term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Phos-Chek 259F is applied by aerial tanker. It is supplied by the manufacturer as a powder, and is prepared for field use by mixing 1.14 pounds per 1 gallon of water to produce a slurry, which is equivalent to 136.6 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire-Trol FireFoam 103B

Fire-Trol FireFoam 103B is a proprietary mixture of anionic surfactants, foam stabilizers, and inhibiting agent (hexylene glycol) (Chemonics Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states that there are no hazardous decomposition products. Fire-Trol FireFoam 103B functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire-Trol FireFoam 103B is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Fire-Trol FireFoam 104

Fire-Trol FireFoam 104 is a proprietary mixture of anionic surfactants, foam stabilizers, inhibitors, and solvents (hexylene glycol, n-butyl alcohol, and butanol) (Chemonics Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states that there are no hazardous decomposition products. Fire-Trol FireFoam 104 functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire-Trol FireFoam 104 is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Fire Quench

Fire Quench is a proprietary mixture of anionic surfactants, foam stabilizers, inhibitors, and solvents (Texas Department of Corrections, Sugarland, TX). The Material Safety Data Sheet states that some oxides of sulfur are hazardous decomposition products. Fire Quench functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. This formulation also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire Quench is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

ForExpan S

ForExpan S is a proprietary mixture of ammonium deceth 2,2 sulfate, 2(2-butoxyethoxy) ethanol, ethanol, sodium myriteth 3 sulfate, myriteth-3, and 1-dodecanol (Angus FireArmourLtd., Toronto, Ontario). The Material Safety Data Sheet states that some oxides of sulfur and nitrogen are hazardous decomposition products. ForExpan S functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. This formulation also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. ForExpan S is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Pyrocap B-136

Pyrocap B-136 is a proprietary mixture of anionic surfactants, foam stabilizers, and other additives (Pyrocap Inc., Springfield, VA). The Material Safety Data Sheet gives no information about hazardous decomposition products. Pyrocap B-136 functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. This formulation also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Pyrocap B-136 is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

http://www.npwrc.usgs.gov/resource/habitat/fireweb/descchem.htm

Forest Magazine • for People Who Care About Our Forests
Fall 2003
Red Rain—Effective? Yes. Toxic? Probably.
By Patricia Marshall

In August 2001, Chris Fisher, an anadromous fisheries biologist for the Confederated Tribes of the Colville Reservation, set out to inspect Omak Creek in eastern Washington in response to reports that the “river was running red.”

His first encounter with the creek revealed fifty to sixty dead summer steelhead and rainbow trout swirling in the center of a pool that formed at the base of a waterfall. He walked five or six miles along the creek, noting dead fish in pools and piled up behind fallen tree limbs. The stream was pink, the rocks and foliage coated with thick red fire retardant that had been accidentally dropped on the creek four days earlier in an effort to control the Saint Mary’s Fire, which burned approximately 8,000 acres in the Omak Creek watershed.

“A multitude of species in all life stages were killed,” he says. “It was morbid.”

Fire retardant is just one of the many weapons in the firefighting arsenal, but it is one of the more spectacular ones. Air tankers with cargo capacity of 2,000 to 3,000 gallons of retardant dropped approximately 20,000 loads to slow the advance of fire in 2002. The entire fire aviation program, which involves multiple agencies, has expenditures in excess of $250 million a year, at least 15 percent of the federal wildfire budget. Several years ago, the cost of fire retardant alone was estimated at $95 million.

When used correctly, retardant can be effective. Retardants are composed primarily of common agricultural fertilizers, such as ammonium sulfate and diammonium phosphate. Unlike water, retardant is dropped ahead of flames to slow them and give ground support forces time to build fire lines. But there is little disagreement that when retardant comes in contact with aquatic areas, the resulting environmental damage can be severe, causing immediate fish kills and polluting the waterways.

Some retardants contain sodium ferrocyanide, an agent that is used as an anticorrosive ingredient. Sodium ferrocyanide became a lightning rod in March 2000, when the U.S. Forest Service banned the use of retardants that contained it. Of the two companies that provide retardant to the government, Fire-Trol and Astaris, only Fire-Trol contains sodium ferrocyanide. The company vigorously protested the ban, which was lifted a month later. The Forest Service agreed to discontinue the use of retardant with sodium ferrocyanide by 2004.

Rob Crouch, spokesman for Phoenix-based Fire-Trol, says the danger of fire retardant comes not from the sodium ferrocyanide, but from the drop on aquatic systems.

“Taking the sodium ferrocyanide out won’t change a thing,” he says. “Every retardant causes damage when dropped into waterways.”

In a way, he’s right. Sodium ferrocyanide converts to free cyanide, its toxic form, only when it is exposed to ultraviolet rays through water, says Susan Finger, a toxicologist at the U.S. Geological Survey. Free cyanide is immediately and acutely toxic to fish, but without the presence of sunlight and water, conversion won’t occur and sodium ferrocyanide will cause no harm. After the conversion, it dissipates almost immediately.

The other retardant ingredients have more staying power. At Omak Creek, Jeff Fisher, a biologist and toxicologist working for a private contractor, says water samples showed only trace amounts of cyanide, but ammonia levels were several orders of magnitude higher than what is tolerable to fish. He speculates that it was the ammonia that caused the large-scale mortality rate, but acknowledges that it is hard to know for sure.

Whether or not retardant drops are lethal depends on several factors. The amount of the load, the size of the stream and the volume of the flow will affect concentration and dilution levels. Most forest fires occur during hot summer months, when the potential for chemicals to dilute rapidly is diminished due to low stream flows.

Forest Service officials estimate that during the 2002 fire season, one of the worst the West has seen, 33.6 million gallons of retardant were pumped from fixed-wing stations, and perhaps half again that much from temporary portable bases. That’s a lot of fertilizer to be dumped on the ground or, in some cases, in the water.

The Forest Service requires a 300-yard buffer zone around waterways, but accidents do happen. A report from the National Interagency Fire Center in Boise documents six cases of retardant hitting waterways since 2001, but because there is no standardized method for reporting retardant drops into streams and because occurrences are often dealt with locally, it is difficult to gather information on a national level.

But avoiding waterways doesn’t address the use of retardant in its entirety. Retardant chemicals can enter the waterways postfire through run-off. The amount of time the chemicals remain toxic following a fire depends on soil conditions, weather and aquatic dilution. Excessive fertilizer dropped on sensitive ecological areas can kill plants or cause temporary burn.

And let’s not forget the human cost. After air tanker crashes resulted in the deaths of five airmen last year, Forest Service Chief Dale Bosworth convened a blue ribbon panel on aerial safety. Their report, delivered in December 2002, stated, “Millions of dollars are spent each year to keep the approximately 40 to 46 large air tankers on-contract and available for firefighting. However, there are few checks and balances to ensure that the aircraft are airworthy and safe to fly throughout a fire season.” The panel determined that the fatal air tanker crashes were predictable given the age of the fleet and the difficulty of maintaining it. Following the crashes, the Forest Service grounded about a quarter of the fleet pending safety inspections and has since instituted a rigorous inspection and maintenance program.

Is the use of fire retardant worth the high cost? Tim Ingalsbee, director of the Western Fire Ecology Center for the American Lands Alliance, says there is a narrow range of conditions under which retardant is effective. “There are some benefits, but you have to have the right time, place and condition for retardant use. And that’s not happening. It’s just wholesale toxic chemical dumping on national forests.”

At Omak Creek, an estimated 10,040 trout were killed in a 5.5-mile stretch. The incident report states that “it is suspected that most, if not all, natural reproduction of summer steelhead in Omak Creek were killed from this retardant drop.”

Jeff Fisher, the biologist who consulted on the Omak Creek spill, is not sure that the use of fire retardant was warranted for the Saint Mary’s Fire.

“It was a low-intensity burn with not a lot of property at risk,” he says. “They probably didn’t need to use anything. They just direct-hit this creek.”

http://www.fseee.org/index.html?page=http%3A//www.fseee.org/forestmag/0303redrain.shtml

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CDF Joins Federal Agencies in Banning Use of Certain Fire Retardant Products

SACRAMENTO - The California Department of Forestry and Fire Protection (CDF) has suspended use of certain fire retardant chemicals which have been shown to release unacceptable levels of cyanide into the environment.

The CDF purchases its retardant from the USDA Forest Service. The Forest Service announced this week the results of a new study ("The Effects of UVB Radiation on the Toxicity of Fire Fighting Chemicals") which identified a particular type of retardant that poses a threat to aquatic wildlife under certain conditions.

The retardant, produced and distributed by FIRE-TROL Holdings, L.L.C., includes a corrosion inhibitor (to protect airplane tanks) which when combined with the colorant in the retardant and exposed to sunlight and water, creates ferrous cyanide as a by-product. The new information indicates that when this particular fire retardant is accidentally dropped into surface water, the level of cyanide that results could be in violation of EPA standards.

"When the U.S. Forest Service informed us of the extent to which cyanide is present in this product, we took immediate action to stop any further use of this product," said Jim Wright, Assistant Deputy Director for Fire Protection. "Because CDF avoids dropping retardant in or around water, chance of any harmful impact are slight".

The CDF is currently exploring other sources for retardant supplies for the coming fire season.

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http://www.fire.ca.gov/php/newsreleases_content/downloads/2000Archive/MAr312000.htm

Fighting Fire From The Air

- S-2T Airtanker
- S-2A Airtanker
- UH-1H Super Huey Helicopters
- OV-10A
- Short Haul Rescue
- Federal Excess Property
- Modular Airborne Fire

Fighting System

In support of its ground forces, the CDF 2003 emergency response air program includes 16 Grumman S-2T 1,200 gallon airtankers, 7 Grumman S-2A 800 gallon airtankers, 9 UH-1H Super Huey helicopters, and 13 OV-10A air attack aircraft. From 13 air attack and nine helitack bases located statewide, aircraft can reach most fires within 20 minutes.

The air attack planes fly overhead directing the airtankers and helicopters to critical areas of the fire for retardant and water drops. **The retardant used to slow or retard the spread of a fire is a slurry mix consisting of a chemical salt compound, water, clay or a gum-thickening agent, and a coloring agent. At nine pounds per gallon an S-2A can carry 7,200 pounds. The S-2T can carry 10,800 pounds.**

The CDF OV-10A air attack plane allows personnel to direct air operations from above an incident.

While both airtankers and helicopters are equipped to carry fire retardant or water, the helicopters can also transport firefighters, equipment and injured personnel. All CDF Aircraft are strategically located throughout the state at airbases and helicopter bases. During high fire activity, CDF may move aircraft to better provide statewide air support.

The average annual budget of the CDF Aviation Management Program is nearly $20 million. A total of 18 CDF personnel oversee the program with an additional 130 contract employees providing mechanical, pilot and management services to the program.

CDF's current contractor is DynCorp. They provide airtanker and air attack plane maintenance and pilots, as well as helicopter maintenance. All CDF helicopters are flown by CDF pilots.

CDF is in the middle of an air modernization program that retrofits S-2E/G aircraft, which are larger than their S-2A predecessors, with turboprop engines and 1,200 gallon retardant tanks. Sixteen of these new S-2T airtankers will be in service during the 2003 Fire Season.

http://www.fire.ca.gov/FireEmergencyResponse/Aviation/Aviation.asp

FIRE FOAM
An extinguishing agent, chemically and/or mechanically produced, that blankets and adheres to the fuel, reducing combustion. It relies on moisture it contains for its effectiveness, so is a short-term suppressant.

FIRE RETARDANT
Any substance except plain water that by chemical or physical action reduces the flammability of fuels or slows their rate of combustion, e.g., a liquid or slurry applied aerially or from the ground during a fire suppression operation.

http://fireteam-sw.com/whitney/cavecreek/def_wildlandfire.html

Aerial Fighting Materials

Fire retardant, wildland fire foam, and water are dropped by firefighting aircraft. Long-term chemical fire retardant that remains effective for days is preferred for use in indirect attack where retardant lines are expected to hold for long periods of time. Wildland fire foam is effective for several hours and is best used in direct support of ground firefighters. Water is least effective, but most readily available. It can be used in direct support, especially if the supply is plentiful and ground firefighters are in close proximity for follow-up action. Firefighting chemicals must be approved for use by the USDA-Forest Service to ensure both firefighting effectiveness and human/environmental safety. Large airtankers load and reload with retardant at established or temporary airtanker bases located strategically across the country. Normally, airtankers can be reloaded within 10 minutes.

http://www.afia.com/Tutorialinternet.html

http://www.afia.com/backgrnd.html