REPORT

Draft
Mill Creek Watershed
Management Strategy Report

Prepared for

Mill Creek Conservancy

NOVEMBER 1996

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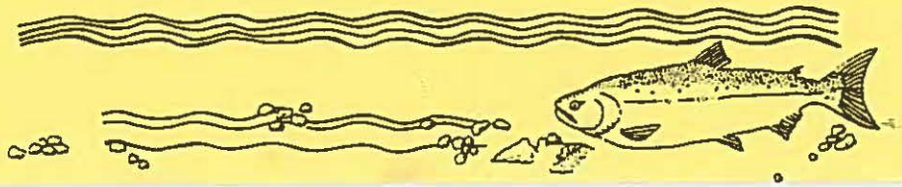
MANAGEMENT STRATEGY REPORT

DEADLINE FOR COMMENTS: NOVEMBER 29, 1996

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SECTION 1.0

Project Description

The Lassen Watershed Project is a collaborative effort between Los Molinos Unified School District and the two local watershed groups—Mill Creek Conservancy and Deer Creek Watershed Conservancy—to protect, enhance, and cultivate understanding of the watersheds. Each project partner has designed a specific program that is consistent with the overall goals of the project. The Mill Creek Watershed Management Strategy Report constitutes the portion of the Lassen Watershed Project sponsored by Mill Creek Conservancy.

This project has provided the opportunity to develop an understanding of the significant natural resources in the Mill Creek Watershed and to promote resource management and stewardship for this unique watershed. The Mill Creek Watershed Management project consisted of eight public meetings focused on creating a watershed management strategy report that contained a current assessment of existing conditions and recommendations for future actions to enhance the ecological integrity of the watershed.

1.1 Introduction

The Mill Creek Watershed Management project goals are centered around creating a community effort to promote protection, enhancement, and stewardship for the Mill Creek Watershed. The educational component of the project provides local youth with extensive hands-on learning experiences and interaction with resource professionals.

The Mill Creek Watershed Management Strategy Report contains six sections:

- Description of the project
- Public involvement/stewardship development opportunities
- Description of the existing conditions of the Mill Creek Watershed
- Information regarding condition of the spring-run chinook and steelhead habitat and populations
- Existing resource protection measures
- Water Management Strategy including Recommendations and monitoring activities

The appendices include a comprehensive list of materials including the Resource Inventory (Appendix A), annotated bibliography, list of Watershed Advisory Committee (WAC) members and other resource materials.

Funding for the Lassen Watershed Project was provided by the Regional Water Quality Control Board (RWQCB) and the State Water Quality Control Board in conjunction with the Environmental Protection Agency (EPA) Clean Water 319 grant program. The Mill Creek Watershed management portion of the grant included funding for eight public Scoping

Study sessions, printing and mailing of project materials, and professional project consultant with experience in watershed planning and Geographical Information System (GIS) mapping. The grant required a 40 percent match of funds by the project partners. The match requirement was adhered to and exceeded in all project categories. The participants attendance at meetings and input for this report was of utmost importance to make the project a success. The value of the participants input far exceeds the dollar value assigned to the match.

The Los Molinos Unified School District (LMUSD) staff provided a huge contribution of time and energy toward the development of the project. The Mill Creek Conservancy provided the bulk of administrative tasks for the required match. This report is the product of all the participants' work and their recommendations for future resource protection actions for the Mill Creek Watershed.

In addition to the EPA grant, the Mill Creek Conservancy obtained a GIS grant from the National Fish & Wildlife Foundation that augments the Scoping Study function. A WAC subcommittee was formed to make decisions regarding the development of the GIS for the Mill Creek Watershed that would be useful for the management strategy report. The GIS information is a valuable addition to the Mill Creek Watershed Management Strategy Report because it will provide a mapping capability that was not included in the original Scoping Study grant. The ability to develop a state of the art data base and produce maps that delineate current resource information was a great addition to the final product. The input from various resource professionals and the sharing information resulted in the preparation of maps with current information that was reviewed by the WAC. The Scoping Study sessions and GIS elements are the integral to the creation of the Mill Creek Watershed Management Strategy Report.

1.2 Background

The Mill Creek Conservancy is a non-profit conservation organization composed of land-owners and interested parties devoted to resource protection throughout Mill Creek Watershed. A key mission of the group is to ensure that the existing pristine condition and biological integrity of the watershed are maintained in perpetuity through appropriate land uses. Figure 1-1 shows the location of Mill Creek and Mill Creek Watershed.

Mill Creek Conservancy has been in existence since 1994 when it became involved in the numerous resource protection measures for the watershed. An initial task of the group was to create a Memorandum of Understanding (MOU) with 17 partners who were interested in developing a Watershed Management Strategy for the Mill Creek Watershed. A copy of the MOU and a list of signatories is provided in Appendix B.

One of the MOU signatories, LMUSD, became a key partner for the long-term development of community stewardship and hands-on learning projects for the students. A member of LMUSD and Partners In Education formulated a watershed grant application in the fall of 1994. Mill Creek Conservancy was invited to join the project. The grant mission included a partnership to establish an integrated project with a hands-on learning component and a watershed management strategy component, which was desirable and well suited for both project partners. The Mill Creek Conservancy Board of Directors unanimously approved the partnership in the Lassen Watershed Project with LMUSD.

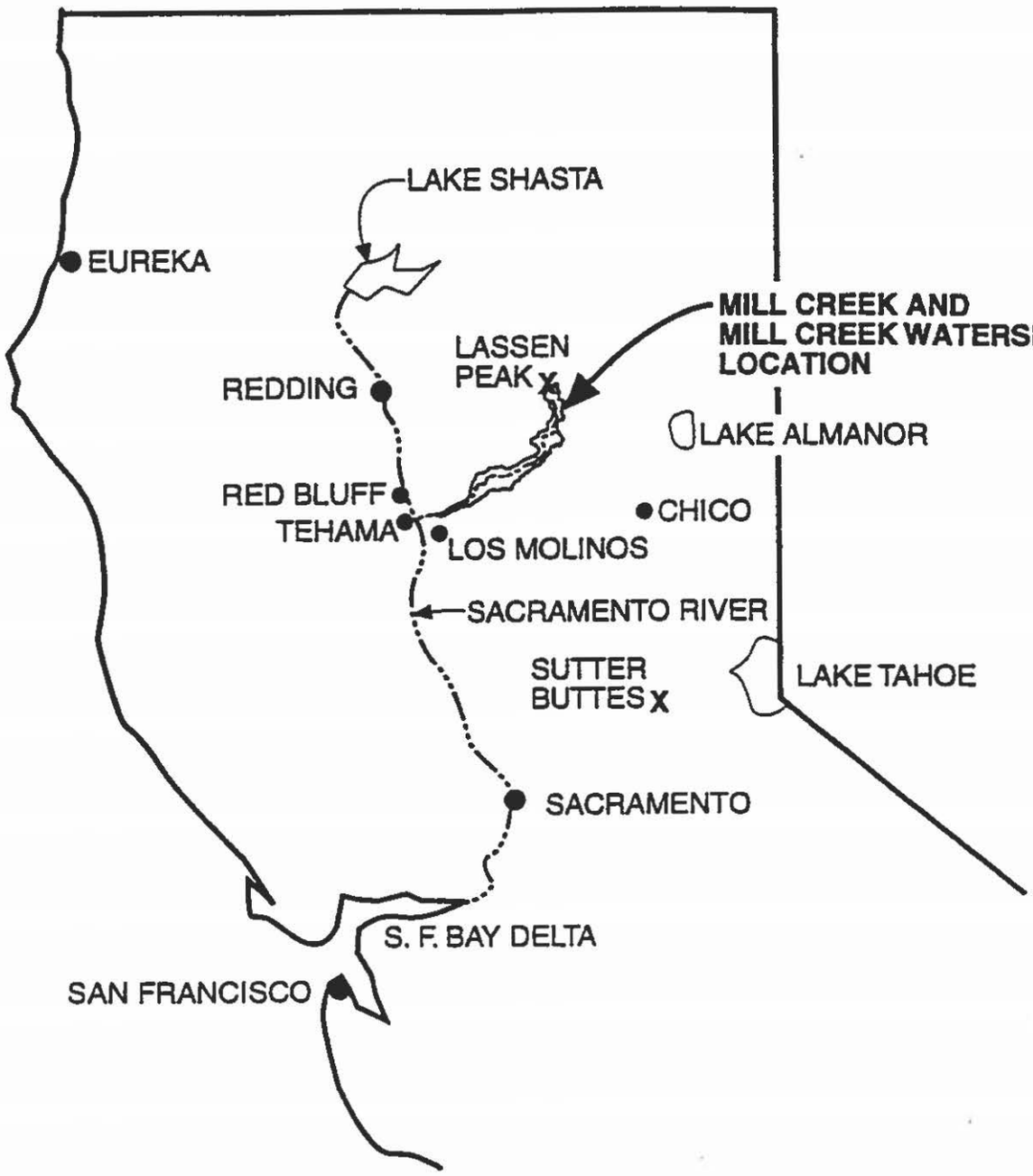


Figure 1-1
Mill Creek and Mill Creek Watershed
Watershed Management Strategy Report
Tehama County, California

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Refinement of the original concept took over a year and resulted in a well-defined partnership between LMUSD and the Mill Creek Conservancy. The main purpose was to pursue joint activities including the Scoping Study process directed at creating a watershed management strategy and an educational component highlighted by student involvement in watershed projects. The joint grant provides funding for the various project components for a 3-year period. The LMUSD students started a water quality monitoring project on Mill Creek in the fall of 1995. This monitoring project will continue for the full term of the grant.

In January 1996, the Mill Creek Conservancy initiated the Scoping Study sessions to create the Watershed Management Strategy Report. The mailing list for the project exceeded 120 individuals. The eight Scoping Study sessions were held throughout 1996 and included field trips to Mill Creek and an evening community meeting. The Scoping Study sessions were attended by the Watershed Advisory Committee (WAC) members, which includes various landowners, agency representatives, environmental interest groups, and other stakeholders and interested parties. Upon conclusion of the final Scoping Study session, the Mill Creek Conservancy will use the report recommendations and contacts to pursue comprehensive resource protection for the Mill Creek Watershed.

1.3 Mission Statement/Shared Goals

The first task of the WAC was to review and approve a mission statement and related goals for the project. This was a critical first step to ensure that input from all participants would be recognized and that all participants had a shared interest in the outcome of the Scoping Study process. The initial Scoping Study sessions were devoted to the development of the mission statement and shared goals with the assistance of the WAC facilitator. The WAC mission statement is below and is also in Appendix C with the goals and project tasks:

> *We seek to establish a local community/stakeholder partnership effort to develop a watershed management process to promote the protection, enhancement and stewardship of Mill Creek and provide an educational opportunity for relevant experiences for local youth.*

The mission statement and shared goals were the guiding principles in all the Scoping Study session discussions of resource issues and were used in the development of the recommendations.

1.4 Impetus and Purpose of Report

The undeveloped nature of the majority of the Mill Creek Watershed has resulted in the retention of many pristine qualities. There has been a great deal of focus on the Mill Creek Watershed from various groups and organizations recently because of the healthy quality of habitat and distinct species that exist in this area. The headwaters of Mill Creek are within Lassen Volcanic National Park; the majority of forest lands have a wilderness designation and there are large parcels without development. The local community, universities, conservation groups, agencies, and others have recognized the many outstanding cultural and natural resources within the watershed.

The occurrence of naturally sustaining spring-run chinook salmon and winter-run steelhead within the watershed has added to the mystique of this unique area. The upper reaches of

Mill Creek constitute the highest elevation of spawning spring-run chinook salmon in California. Mill Creek and adjacent areas represent a fraction of the historic spawning habitat of spring-run chinook salmon and Central Valley winter-run steelhead. The regulation of Mill Creek's spring-run chinook salmon and winter-run steelhead has also entered the political/legal realm.

In April 1996, the California Fish and Game Commission (Commission) rejected a petition to list the Sacramento River spring-run chinook salmon as a state-listed endangered species. In the Commissions Notice of Finding (May 1996), the Commission determined that there was insufficient evidence in the petition and in the record as a whole to find there was an immediate threat to the continued existence of the spring-run chinook salmon or that a listing may be warranted. The Commission found that the petition did not provide sufficient information in the category of degree and immediacy of threat and lacked a discussion on taxonomy that would establish the Sacramento River spring-run chinook salmon as a listable entity. In August 1996, the Commission initiated a regulatory action to adopt Section 670.6, Title 14, California Code of Regulations, regarding Commission Policy on Monitored Species requiring the California Department of Fish and Game (CDFG) to monitor and report on species that were previously considered for candidacy or listing by the Commission.

Several groups disagreed with the Commission's actions and felt strongly that meaningful changes to benefit salmon can only be realized by approving the "Endangered Species" designation for the spring-run chinook salmon. These groups support the CDFG staff's recommendation that the species is in peril and that the listing is warranted.

The National Marine Fisheries Service (NMFS) received a petition seeking protection of west coast steelhead, which includes the Mill Creek steelhead. A status review was released in August 1996 that categorizes the Mill Creek steelhead as presently in danger of extinction. There was special mention of the genetic characteristics of the Mill Creek steelhead in the NMFS proposed rules that were published in the Federal Register. There will be a one-year period to review the data and propose rules for management of the species prior to the consideration of listing the Mill Creek steelhead as an endangered species.

The impetus of the report was generated by the amount of interest in the resources and by the commitment of the local community that endeavors to care for Mill Creek Watershed. The spring-run chinook salmon and winter-run steelhead, the cultural resources, the late successional forest, and the roadless wilderness areas have all contributed to the wide spread interest in this area. There has been a large response by the local community, as demonstrated by the success of the Scoping Study sessions, to become involved in resource protection activities.

The intent for this project was to involve all interested persons in a process to create interest and information regarding the Mill Creek Watershed. To accomplish this goal, the Scoping Study sessions were designed to provide a forum to allow input from interested persons regarding the management issues of this watershed.

The purpose of the Watershed Management Strategy Report is to characterize the watershed, identify issues of concerns, influence planning efforts, and promote watershed stewardship. The information for the report has been generated during the eight scoping sessions and material prepared by participants. This Watershed Management Strategy

Report will serve as a tool to promote resource stewardship and to guide the decision-making process for project priorities within the watershed. This report provides baseline information, a Resource Inventory, and other important data sources for use by all participants, the public, and the Mill Creek Conservancy.

1.5 Information Development Process Watershed Management Strategy Report and GIS

1.5.A Watershed Management Strategy Report

This report is based on requirements defined within the EPA grant, which identified specific topics to be addressed as part of the Mill Creek Watershed Management Strategy. During the early stages of the WAC Scoping Study sessions, participants developed core components of the report through open discussion of the project purpose and goals, existing conditions of the watershed; and specific areas of concern. The Mill Creek Conservancy and the project consultant, CH2M HILL, then developed an overall outline for the report and solicited input from the WAC participants. Once the outline was finalized, assignments were made and sections of the report were prepared by WAC participants with specific areas of interest and expertise. Ultimately, more than 40 individuals contributed to the report. The material submitted was edited and compiled by CH2M HILL and submitted in draft form to the WAC for review. Three drafts of this report were prepared and commented on by the WAC prior to the release of the final Watershed Management Strategy Report. Comments provided during the review were incorporated into a final version of the Watershed Management Strategy Report.

1.5.B Geographic Information System

In conjunction with the Scoping Study process, CH2M HILL assisted the Conservancy in the development of a Geographic Information System (GIS). The GIS provides the Conservancy with the following features:

- Information management tool to aid in the decisionmaking process
- Quality mapping products for public presentation
- Recordkeeping/monitoring tool
- Potential to develop new resource information layers

A GIS map format was developed and agreed upon by the Conservancy and participating agencies and data sources were identified. As part of the Scoping Study sessions, mapping products were presented and reviewed by WAC members who provided comments for improvements to the GIS mapping products. The GIS maps contain a resource data inventory developed by gathering data layers from participating agencies and combining the data layers in a common format for subsequent analysis and display. The GIS maps are in Appendix D and include:

- Base map of overall watershed
- Base maps of lower, middle, and upper reaches of watershed
- Land use

- Vegetation
- Fisheries
- Fire history
- Resource protection

The initial task in the GIS development was to generate a base map of the Mill Creek Watershed. Data were acquired from a variety of sources and input to the GIS. The base map data layers include watershed boundary, roads, streams and rivers, major land use, wilderness areas, powerlines, railroads, water diversions, creek monitoring points, public land survey, and county lines. Figure D-1, Appendix D, is a base map of the overall watershed at a scale of 1:76,200 (1 inch = approximately 1.2 miles). Figures D-2, D-3, and D-4 (Appendix D) are base maps of the lower, middle, and upper reaches of Mill Creek at a scale of 1:38,100 (1 inch = approximately .6 miles).

The maps were divided into three reaches which provides additional detail and are useful for resource planning purposes. The delineation of each reach was discussed and agreed upon by the WAC. The Upper Reach extends from Lassen Volcanic National Park to Black Rock. The Middle Reach encompasses the area between Black Rock and the canyon mouth also known as the USGS gauge location. The Lower Reach is from the canyon mouth down to the Sacramento River.

The next task was the development of the resource overlays. These layers include land use, ownership, fisheries, vegetation, fire history, and recreation. The resource maps (Figures D-5 through D-8 are provided in Appendix D. The map layers were generated by a combination of digitizing map data, and acquisition of digital data from participating and non-participating agencies. Additional layers may be developed at a later date including wildlife, soils, etc.

Data for the base maps and resource layers were obtained from a variety of sources. These sources include the California Department of Water Resources, Sierra Pacific Industries, Collins Pine, Lassen National Forest, California Department of Fish and Game, California State University-Chico, University of California-Davis, Los Molinos Mutual Water Company, Bureau of Land Management, and California Rivers Assessment. The comprehensive nature and quality of the Mill Creek Watershed GIS maps are a direct result of the level of information that was generously shared by all cooperating sources. Each source, public and private, will receive a set of final maps and the supporting electronic data information.

GIS training was also provided to the Conservancy, LMUSD, and community members. The training consisted of six 4-hour sessions and included hands-on use of the data layers developed for this project. GIS software and hardware acquisition was provided by the National Fish and Wildlife Foundation grant.

Figure 1-2 outlines the Scoping Study process used to develop the strategy report and the GIS mapping.

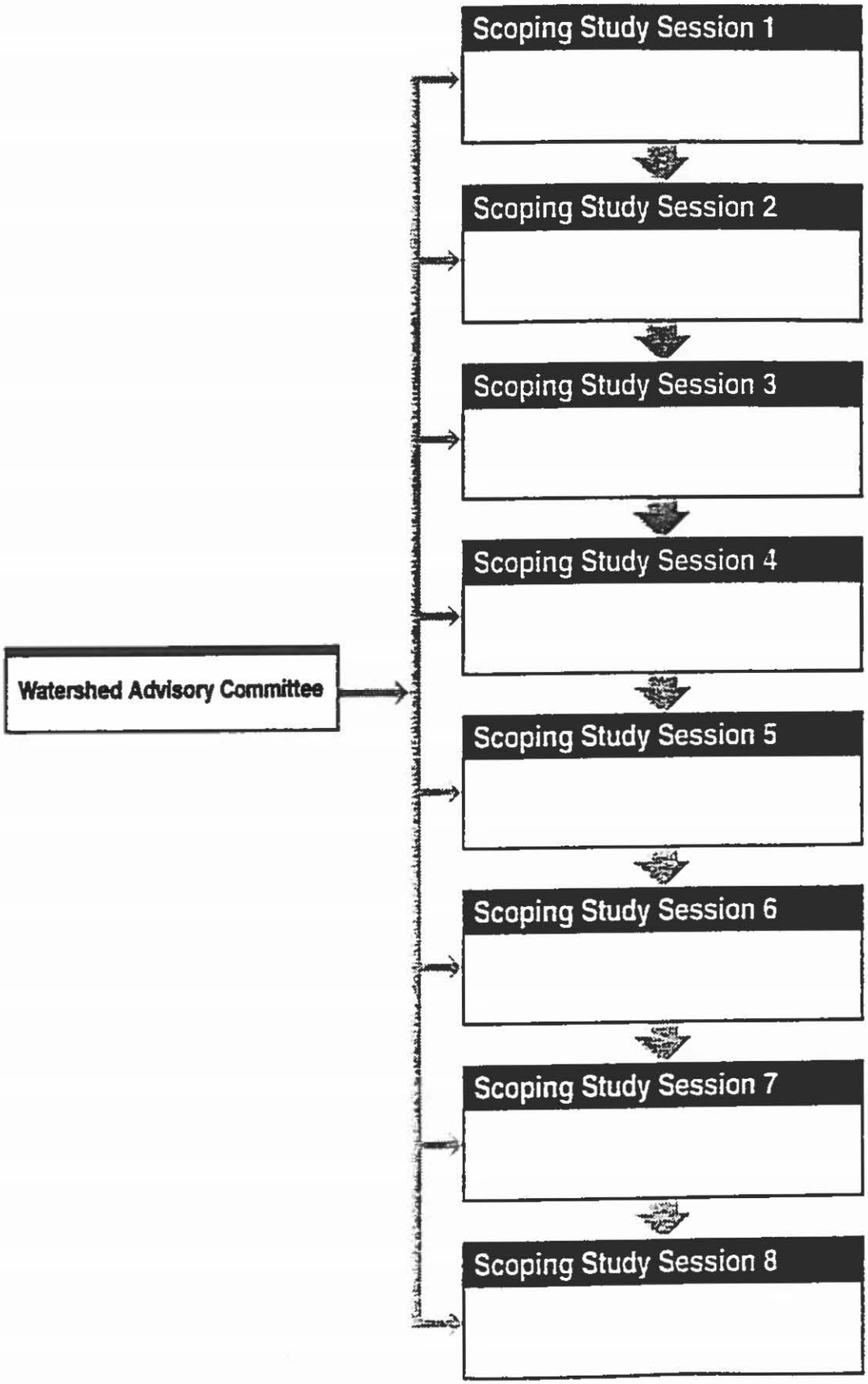


FIGURE 1-2
DEVELOPMENT PROCESS
STRATEGY REPORT
MILL CREEK WATERSHED MANAGEMENT

SECTION 2.0

Public Involvement/Stewardship Development

The cornerstone of the Lassen Watershed Project is to promote stewardship development by creating the opportunity for concerned people to participate in a discussion of critical resource protection issues. The Scoping Study sessions were intended to create public interest and provide opportunities and encouragement for involvement with stewardship activities. This section describes the Scoping Study process, the types of public meetings that were held, the comprehensive educational component, various Americorps projects, a profile of the WAC members, and potential future stewardship programs.

2.1 Scoping Study Process

The Mill Creek Conservancy believes the long-term protection of the Mill Creek Watershed cannot be accomplished by one individual, one group, or one agency. Carrying out the various complexities involved with watershed management will require the integrated, coordinated efforts of many concerned people. The Scoping Study process was designed for that purpose. The Conservancy identified approximately 100 people who would be interested in participating in the Scoping Study process. Additional participants have attended and become involved in the Scoping Study sessions because of public outreach efforts. Public notices of meetings were published in the local newspaper, and notices were posted within the community to promote additional citizen involvement. The open nature of the Scoping Study sessions provided an excellent atmosphere to address a wide variety of concerns.

2.2 Scoping Study Sessions

The WAC conducted eight Scoping Study sessions to accomplish the following project goals:

- Characterize the watershed
- Identify issues of concerns
- Influence resource planning efforts
- Promote watershed stewardship and educational opportunities
- Development recommendations

In addition to the Scoping Study sessions, WAC subcommittees were formed and met independently to discuss and work on specific areas of interest, which included GIS, water quality monitoring, fire planning, and revegetation issues.

During the first Scoping Study session, with the aid of a facilitator, the committee agreed to ground rules for meeting conduct, project mission statement, and goals (see Appendix C). At the second session, project goals were further refined. Several sessions focused on

providing information regarding the current status of the watershed. Two field trips were made to observe the lower and upper watershed areas. An evening community session was held to highlight the progress of the WAC's work, generate comments from the community, and promote interest in resource stewardship. The final sessions concentrated on reviewing the Watershed Management Strategy Report and preparing recommendations.

2.3 Educational Component As A Function Of Stewardship

The LMUSD is located in southern Tehama County, and includes the communities of Tehama and the unincorporated areas of Los Molinos and Vina. Currently, there are 240 students at Los Molinos High School, 378 students at Los Molinos Elementary K-8, and 72 students at Vina Elementary K-8.

The involvement of the LMUSD and Partners In Education, a non-profit organization, in the Mill Creek Watershed project is a restructuring of the educational experience. It is an opportunity for students to be involved in relevant hands-on education and is leading to reform strategies such as block scheduling, job service learning, shadowing, internships, county-based academies, and integrated academics. LMUSD faculty are developing grade-level-specific curriculum for the study of the local watershed and its linkage to the quality of life for the community. Students have the opportunity to participate in relevant and engaging projects that are integrated with core academic curriculum.

Through the use of funding opportunities, technology has become an integral part of the project, students have an opportunity for both relevant individual and team projects and investigations of real-life situations. The project allows the cooperating partners to mentor our students and the students to serve community needs.

Citizens and students alike are learning to nurture the concepts of volunteerism, leadership, community pride, understanding, and citizenship. From this strong foundation, LMUSD will continue to expand and improve the service learning activities on the Dye Creek Preserve and to reach out to the outlying communities to develop and support new partners and projects such as the Lassen Watershed Project.

2.4 Americorps Projects

The Americorps watershed project partnerships have been particularly beneficial to the educational component of this program, with two of the seven Americorps watershed project members assigned to three schools within district. The Americorps members' contributions include working with school staff to implement service learning and coordinating community-based service projects. Each of these service-learning coordinators meet individually with teachers to perform needs assessment, develop goals for specific projects, and evaluate effectiveness. The Americorp CCC Service Crew will assist in implementing the Mill Creek revegetation/demonstration pilot project. Americorps representatives have participated in the Scoping Study process and provided valuable input regarding resource protection measures.

2.5 Watershed Advisory Committee Participants

The Scoping Study process has enjoyed diverse and knowledgeable participation by numerous individuals interested in resource management for the Mill Creek Watershed. The sessions have been well attended, an average of 40 people per session. There was a core group of WAC participants who attended every session. WAC participants include landowners; representatives from local, state, and federal agencies; environmental organizations; academia; and the LMUSD students and faculty. The diverse group has provided a full dimension to all discussions and increased the scope of issues that are covered in the report. This process created the opportunity for the participants to voice their opinions regarding the future management of Mill Creek. A list of the WAC members is provided in Appendix E.

2.6 Community Stewardship Meeting

A primary goal of this project and the Mill Creek Conservancy is to promote resource stewardship for the Mill Creek Watershed. The goal of creating an environment to promote stewardship and interaction with representatives from resource protection agencies and organizations was achieved at the Community Stewardship meeting.

At the evening Community meeting there were numerous displays and information regarding stewardship programs. The participants including LMUSD personnel and students, Americorps, CDFG, Lassen Forest Service, The Nature Conservancy, Tehama County Resource Conservation Service, Sacramento River Discovery Center, U.C. Davis - California Rivers Assessment project, Tehama County Groundwater Management Project, Lassen Loomis Museum Association, CH2M HILL, and Mill Creek Conservancy.

There were approximately 80 attendees that enjoyed the evening Stewardship Fair. In addition to visiting the numerous displays, there was a short program that included introductions of the display participants, a presentation by the LMUSD students, and a Community input session. Questions from the community included issues dealing with siltation, status of the mouth of Mill Creek, impact from drought conditions, timing and migration requirements of salmon, water releases, improvements to Ward Diversion, and fish count efforts. All the community concerns were presented to the WAC for consideration prior to adopting final recommendations to ensure that all issues have been addressed.

The amount of interest was a signal of the commitment of the community to pursue resource protection for Mill Creek Watershed.

SECTION 3.0

Existing Conditions of the Mill Creek Watershed

Knowledge of the existing conditions of the Mill Creek Watershed is necessary to formulate a resource management strategy. Development of current information pertaining to critical factors that influence the watershed is a key component of this report. This section includes descriptions of existing conditions for the following areas:

- Climate
- Topography
- Geology
- Land use
- Hydrology
- Vegetation
- Wildlife
- Erosion potential
- Fire history

These factors create the environment of the Mill Creek Watershed.

3.1 Climate and Topography

Mill Creek originates on the southern slopes of Lassen Peak and flows generally to the southwest to its confluence with the Sacramento River near the towns of Tehama and Los Molinos. The total length of the stream is about 60 miles, and the watershed drains approximately 134 square miles, almost entirely within Tehama County. Elevations within the watershed range from over 8,000 feet at the stream's headwaters in Lassen Volcanic National Park to approximately 200 feet on the Sacramento Valley floor. Mill Creek is confined within a steep-sided, narrow canyon except for a few alluvial meadows at the 5,000-foot level. The lower 8 miles of Mill Creek below the mouth of the canyon flow through the valley area near Los Molinos.

The creek flows through Lassen Volcanic National Park, the Lassen National Forest including the Ishi Wilderness Area, and the Tehama Wildlife Area. The private lands constitute approximately 50 percent of the watershed area. These properties are found throughout the watershed and include ranches, large undeveloped parcels, the Gray Davis Dye Creek Preserve, and smaller parcels on the valley floor.

Climatic conditions in the watershed vary dramatically as a result of elevation differences. Near Lassen Peak, headwaters of Mill Creek, annual precipitation averages 90 inches, with a significant portion of this coming in the form of snowfall. During most winters, the snowpack in the upper watershed may reach several feet of depth and remain until spring. The average annual temperature at the 5,000-foot level (in the upper watershed) is about 45°F, ranging from an average daily temperature of 32°F in January to 62°F in July. On the

valley floor, by contrast, precipitation averages around 20 inches annually, with essentially no snow. The average annual temperature in Los Molinos is about 62°F, ranging from an daily average of 46°F in January to 82°F in July.

3.2 Geology

Geologic formations within the Mill Creek Watershed consist primarily of Cascade Range volcanic formations. These formations were deposited within the last 65 million years, during the Cenozoic era. At its source, located in Lassen Volcanic National Park the headwaters of Mill Creek cut through layers of volcanic material deposited 400 to 600 thousand years ago. Portions of the park are still geothermally active. In these areas, the geothermal processes chemically alter existing deposits as well as increase erosion by melting glacial deposits.

In a small area of the watershed, between Black Rock and Pape Place, Mill Creek has exposed the metamorphic formation underlying volcanic materials.

Downstream of the park and throughout most of its length, Mill Creek flows through the older Tuscan Formation (deposited approximately 2 to 3 million years ago). This formation is primarily composed of volcanic mudflows, but also includes stream materials and volcanic ash and lava (Muffler and others, 1989). The Tuscan Formation is overlain by large quartz-rich lava flows, referred to as rhyolite flows (deposited 1.2 million years ago). These flows comprise the Mill Creek and Lost Creek Plateaus. Along its lowest reaches Mill Creek flows over recent sedimentary deposits of the eastern Sacramento Valley.

3.3 Land Use

Mill Creek Watershed was first inhabited by the Yahi people for approximately 4000 years. There is evidence that they migrated to the upper watershed during the summer months and retreated to the lower watershed during the winter. In the 1850s, European explorers entered the area and by the 1860s settlers were throughout the watershed. Federal land surveys were performed in the late 1800s and in 1908 the Lassen National Forest was created and includes lands in the upper and middle reaches of the Mill Creek Watershed.

Tehama County and the U.S. Forest Service (USFS) are the two main entities with legal authority over land use within the Mill Creek Watershed. Tehama County has permit authority for land uses on private land in accordance with the County General Plan. The USFS manages the majority of public land within the watershed in accordance with the Lassen Land and Resource Management Plan (LRMP).

According to the Tehama County General Plan, the five major land use designations in the Mill Creek Watershed include:

- Timber lands
- Grazing lands
- Agricultural lands
- Recreational lands
- Residential lands

There are numerous polices regarding resource protection within the County General Plan and additional information is contained within Appendix A3.

The main types of land use categories used by USFS in the Mill Creek Watershed are Wilderness, Timber, Developed Recreational, and Special Areas (Mill Creek corridor). Special Areas have been evaluated and deemed to contain unusual characteristics and, therefore, timber harvesting is not allowed. Limited grazing occurs in the Special Areas in Upper Mill Creek.

Much of the public land is considered "multi-use" (e.g., timber land could be used for recreation). Recreational areas may serve as habitat areas and in some cases, also be used for grazing. Land use is a term that describes the predominate type of activity that occurs on a specific area, but does not necessarily indicate the intensity of use.

3.3.A Timber Lands

3.3.A.1 Description of Private Timber Holdings

The Collins Pine Company (Collins) in Chester owns more than 8,000 acres in the Mill Creek Watershed. Collins has owned this land since 1908 and has actively managed it for timber production since 1942.

Nearly all of this timberland can be classified as Sierran Mixed Conifer, which is composed of ponderosa pine, sugar pine, Douglas fir, white fir, and incense cedar. Some minor species such as lodgepole pine, black oak, and maple are also found in this area. Inventory plots reveal that the stocking levels of these stands varies from 80 to 240 square feet of basal area per acre on this Site II and III ground. Because this ground has been managed under an uneven-aged system for the past 50 years, trees range from 1 to 300 years old and from 1 inch to 50 inches in diameter.

All of the Collins Almanor Forest (CAF) ownership within the Mill Creek Watershed has been harvested at one time or another. Although a small portion has not been entered since 1955, most of the area was last logged between 1987 and 1991. All of these harvest operations have used the Collins single-tree selection method which evaluates individual trees on the basis of their health, growth potential, and spacing from residual trees.

Sierra Pacific Industries (SPI) owns 2,500 acres in the Mill Creek Watershed. Approximately 1,750 acres are on the north side of Mill Creek and 750 acres are on the south side of Mill Creek. Approximately 2,000 acres of this property were recently acquired from Pacific Gas & Electric Company (PG&E) in December 1995 and borders Mill Creek. This property will be used for land exchange purposes with the USFS and will not be logged by SPI. The remaining property in the Mill Creek Watershed was acquired by SPI in December 1992. Previous owners were Roseburg Forest Products, Co. and Diamond International Corporation. These lands have been managed for timber production for approximately 100 years. The timber and vegetation types have developed over time from past wildfires, suppression of wildfires, and forest management treatments.

3.3.A.2 U.S. Forest Service Timber Stands

In the upper watershed on USFS lands, large meadows are bordered by aspen; ridge tops, plateaus and slopes are covered with mixed conifer, white fir, and red fir stands. To the south of Black Rock in the middle reach, many of the southern and eastern facing slopes are

rocky and brush covered. Timber types are dominated by Douglas fir and ponderosa and Jeffrey pine stands. Mill Creek's old growth forests are considered valuable and unique because of their diverse and healthy nature. Figure D-5 provides a map of the vegetation in the Mill Creek Watershed (Appendix D).

The recent Sierra Nevada Ecosystem Project (SNEP) report identified the upper Mill Creek canyon as an Area of Late Successional Emphasis (ALSE). Implications from that report regarding the future management of Mill Creek forests are not known at this time. However, because Mill Creek Watershed was included in the SNEP report it is assumed that the regulatory agencies, and perhaps others, will use the information within the report to direct future actions.

In the lower watershed (USFS portion), ponderosa and white pine predominate. Drainages and moist north facing slopes support Douglas fir. Oak, chaparral, and grasslands are the dominant vegetation types at the lower elevations of public ownership.

There are essentially no current stand records for the USFS lands, because it has been a low priority for timber harvest for the past decade. The USFS LRMP timber type data were converted from DRIS to Arc View, and were used in the analysis of vegetation and fire risk changes discussed in the PACFISH section.

Historically, several timber harvests occurred on the slopes and ridge tops above Mill Creek tract and Hole in the Ground, and the Rock Creek Drainage. The limited public ownership on the Mill Creek Plateau has also been harvested. These areas are shown in Figure D-5 (Appendix D), and are used in the estimates of erosion.

At present, activities involving timber harvest in the Mill Creek Watershed are limited to roadside salvage operations. The watershed analysis provides priorities for vegetation management activities in the watershed.

3.3.B Grazing Lands

Table 3-1 provides a summary of historical range allotments for the Mill Creek Watershed. The following sections describe grazing in the upper, middle, and lower reaches of Mill Creek Watershed. Table 3-1 indicates that the amount of grazing on public land within the Mill Creek Watershed is in a downward trend. There are the same indications that the grazing use has been reduced on private lands within the watershed.

3.3.B.1 Grazing on Upper Mill Creek

Cattle have been grazed on the Hanna Ranch, which is the principal ranch on Upper Mill Creek with a management plan to address specific environmental concerns. Historically, this ranch has been grazed since cattle were first introduced to Tehama County in the 1860s. It contains mountain meadows similar to other high country pastures around Lassen Peak. The ranch has three separate pasture areas that consist of an intermingling of private and federal ground. There is a federal exclosure fence along Mill Creek, separating the federal ground in this area, to prevent cattle from grazing near the creek. Some pasture land can be irrigated from Mill Creek via an established water irrigation system. The number of cattle that this ranch will graze has been established over the years through trial and error and is

TABLE 3-1
Lassen National Forest
Range Allotment History in WA Basins
AUMs Permitted Use[a]

	Allotment	1920	1930	1940	1950	1960	1970	1980	1990	1995
Mill	Morgan Springs	382	420	396	594	528	113	362	360	360
	Mill Creek	364	400	330	792	792	660			
	Lower Mill Creek	2,178	1,188	858	160	160	320	1,500	1,500	0
	Pelligreen 1/3	594	175	170	70	44				
	Cone-Ward (1/2)	594	1,250	575	2,180	670	1,226			
Totals	Mill	4,112	3,433	2,329	3,796	2,194	2,319	1,862	1,860	360

[a]Permitted use is typically less than actual use in lower watershed, and greater than actual use in upper watershed.
AUM = Animal Unit Month

adjusted depending on drought conditions and other factors. The maximum permitted numbers are determined by the owners of the ranch and the USFS, and any adjustments in numbers as a result of drought or feed conditions are less than the maximum.

When calculating grazing capacity on any range or ranch, an animal unit month (AUM) formula is used. The AUM is calculated by multiplying the number of permitted animals by the total months of grazing. For example, 1 animal unit times 5 months of grazing equals 5 AUMs. After calculating the total AUMs for a particular area, cattle are rotated from field to field and on and off the range not to exceed the predetermined AUM number. Currently on the Hanna Ranch, the majority of the AUMs are used in the second half of the grazing season. The rotation of cattle from field to field is dependent upon the available grass in each particular area to meet the USFS standards and guidelines at the end of the grazing season.

3.3.B.2 Grazing of Middle Mill Creek

For several decades cattle have been grazed on the middle portion of the Mill Creek Watershed, which is USFS land. The public grazing area south of Black Rock is known as the Tehama Allotment and is approximately 70,000 acres in size. There was a permit to allow 125 animals on the allotment area; however, the permittee did not adhere to the limitation on the maximum number of animals. In addition, the cattle roamed beyond the boundaries of the allotment, creating impacts on other properties. After many years of seeking compliance by the permittee without success, the USFS revoked the grazing permit. At this time, no cattle are allowed on the allotment area until the permit is reissued. A new permit request would be evaluated by the USFS in accordance with all current environmental and resource protection measures.

3.3.B.3 Grazing on Lower Mill Creek

The foothill and pasture areas within the valley floor of the Mill Creek Watershed have a history of livestock use for more than 100 years. The number of sheep grazing the County has ranged from 100,000 to 300,000 and cattle from 2,000 to 60,000 animals. Total numbers today of both areas significantly reduced at this time. At the present time, virtually no grazing is occurring on the south side of the creek from the USFS boundary at Blunkall Crossing to the mouth of the canyon, a distance of approximately 20 river miles. Grazing does occur on the north side of this stretch, but cattle rarely reach the creek because of the rugged steep nature of the canyon. The valley floor was heavily used by grazers until there were reductions in livestock numbers and more of the fertile valley pastures were converted to more intensive agriculture. A significant number of cattle and sheep ranchers took advantage of good forage production, water availability, easy shipping to market, and other management factors.

The foothill area of the watershed contains less fertile ground and subsequently poorer forage production. Nevertheless, the availability of vast amounts of this inexpensive ground in continuous blocks of range, made this area desirable to ranchers.

Throughout the earliest time of grazing, ranchers fenced and improved the range, and cowboys and sheepherders rotated stock to "greener pastures." In the 1950s, the federal government began to assist ranchers with technical assistance and cost-share programs to help build fences, roads, develop water, and improve forage productions. Many of these fences and water developments can still be seen throughout the privately owned watershed. As

more intensive agriculture developed on the valley floor, livestock producers were forced to use less fertile pasture ground. With the advent of many modern irrigation systems and other management improvements, even the poorer soil ground on the valley floor can support intensive agriculture relegating little of the valley floor to livestock operations. Because the foothill areas of the watershed are not well suited to irrigated agriculture, it is anticipated that this area will remain available to livestock operations. Although much of the grazed land within the lower watershed has been well managed, there remains some problem areas (erosion prone, poor production, etc.) that could be improved.

The AUMs available on any specific planning unit are based on a predicted amount of forage available and other management factors. The USDA Natural Resource Conservation Service (NRCS), Cooperative Extension Service, USFS,

Bureau of Land Management (BLM), and other agencies base this forage prediction model on soil type, precipitation, type of livestock, vegetative communities and other elements. Planners usually analyze the forage potential to develop total AUMs, subtract vegetative cover needs for erosion control or wildlife needs and then calculate a beginning stocking rate. Total livestock numbers are then usually adjusted depending upon type and age of livestock, season of use, range conditions and other factors. The overall purpose is to match forage use or removal with actual forage production and other natural resource management needs.

3.3.C Agricultural Lands

Agriculture within the Mill Creek Watershed occurs below the mouth of the canyon on the valley floor. The primary crops are prunes, almonds, and walnut orchards throughout the area between Shasta Blvd. and the Sacramento River. In addition, there is irrigated pasture land on some parcels in this area. These types of agriculture help to maintain the larger parcels within the rural residential/suburban setting of Los Molinos.

3.3.D Recreational Lands

The Mill Creek Watershed provides a wide variety of outdoor recreation opportunities, including sightseeing, camping, hiking, backpacking, fishing, horseback riding, and nature appreciation. State Highways 89, 36, and 172, and Ponderosa Way provide opportunities for sightseeing and access to recreational sites. The Mill Creek Resort (operating under a USFS Use permit) offers cabins and campsites for public rental. The watershed has four developed public campgrounds and four developed picnic/day use areas managed by the USFS and the National Park Service. Popular hiking trails include the Bumpass Hell Trail and Sulphur Creek Trail in Lassen Volcanic National Park, and the Spencer Meadow National Recreation Trail and the Upper Mill Creek Trail in the Lassen National Forest.

Portions of the upper watershed encompass congressionally designated wilderness, including the 78,982-acre Lassen Volcanic National Park Wilderness and the 41,000-acre Ishi Wilderness. The watershed also encompasses inventoried roadless areas recommended by the USFS for addition to the wilderness system, including the proposed 3,900-acre Wild Cattle Mountain Wilderness and the proposed 7,580-acre Mill Creek Wilderness. Thirty-two miles of Mill Creek from the Lassen Volcanic National Park boundary to the western boundary of the Lassen National Forest have been recommended for National Wild and Scenic River designation by the USFS. One emphasis of the existing and recommended

Congressional designations is to protect the outstanding recreation values of the creek and adjacent public lands.

Special visitor attractions in the watershed associated with the creek include the Bumpass Hell thermal area and Mill Creek Falls in Lassen Volcanic National Park, as well as the 15-acre Black Rock Geologic Special Interest Area in the Lassen National Forest. Camp Tehama is operated by Tehama County and provides recreational group facilities in the upper watershed near the Mill Creek Resort. The overnight facilities are used by school, church, and private groups that seek a mountain retreat with a nearby creek.

Hunting is another recreational activity in the Mill Creek Watershed. There are CDFG regulations for deer, bear, and pig hunting that occurs in the watershed. The majority of hunting activity occurs on public land, typically in the fall, and is closely monitored by CDFG. There are bow season and rifle seasons for deer. The Tehama Wildlife Area in the lower middle section of Mill Creek (approximately 1 mile stretch) is managed by CDFG to provide habitat and hunting opportunity for the public. The Dye Creek Preserve provides regulated hunting opportunities. Large animal hunting appears to be on the decline as a recreational activity in California; however, Tehama County is considered a desirable hunting area because of the number of hunting tags sold.

Fly fishing on Mill Creek is rising in popularity. Trout season is from late April to mid-November with a barbless hook requirement and a No Take Provision. No salmon, trout, or steelhead are allowed to be taken. They must be released alive and in good condition. Over 50 percent of the watershed is public land, which provides ample opportunity to the fly fishing public. Public use of the stream is appropriate on public land only.

Mountain biking, bird watching, cross country skiing, and snow shoeing are also popular in Mill Creek Watershed. The number of USFS roads provides excellent opportunities for mountain bike riding and bird watching. Wintertime activities also can involve use of the Highway 172 and USFS roads that are groomed for use by cross country skiers, snowmobilers, and snowshoers.

There is some concern that recreational development in the watershed can adversely impact anadromous fish by providing easier access to sensitive spawning and holding habitat by recreational users whose activities may inadvertently stress the fish of for poachers who deliberately prey upon the species.

3.3.E Residential Lands

3.3.E.1 Lower Mill Creek

Los Molinos and the surrounding area constitutes the main residential area of the Mill Creek Watershed. The settlement of the area occurred in the 1850s, and it has been an agricultural community ever since. Today, Los Molinos is considered a suburban/rural residential area that contains primarily single-family homes with a population of _____. The development density is highest adjacent to the Highway 99 corridor ,which also includes some commercial businesses. The domestic water source for residential use is community groundwater system regulated by the Community Service District. Mill Creek diversions supply irrigation water only.

Los Molinos is centrally located with good access to Chico and Red Bluff, California, and Highway I-5, which may make it attractive for additional growth. There has been recent interest in subdividing areas adjacent to Mill Creek. The opportunity to obtain "creek frontage" appeals to many potential home buyers who wish to enjoy the many associated attributes. However, new suburban development adjacent to Mill Creek may pose a threat to the significant resource values within the sensitive riparian area.

Some of the problems associated with residential growth adjacent to Mill Creek include:

- Improper disposal or use of chemicals that can degrade water quality
- Destruction of riparian habitat that can reduce stream cover and increase water temperatures
- Planting of non-native plants that can eliminate wildlife habitat and reduce biodiversity
- Grading work that can increase erosion of stream banks and add sediment to the stream

There may also be problems associated with "attractive nuisance" nature of the creek areas that may increase vandalism and trespassing activities in some areas.

This report contains specific recommendations regarding the need to protect these sensitive areas from the problems associated with residential development. Project recommendations include improve wildlife habitat, reduction in sedimentation, erosion and soil disturbance activities, restore and maintain native riparian vegetation, educate and promote stewardship, and improve water distribution systems. Success in these areas could remedy the majority of concerns mentioned above.

3.3.E.2 Upper Mill Creek

Residential use within the upper watershed area includes one private ranch, established in the 1860s, and the Mill Creek Homesites (a summer home cabin development circa 1920s). These cabins were built on USFS land and are presently used by private individuals. There is a Special Use Permit with conditions regarding the use of the cabins and the Mill Creek Resort. The leasees are in the process of applying for a Land Exchange with USFS to allow fee title ownership of the cabins. The land exchange application evaluation is involved and includes environmental and public review. The entire transaction is expected to take several years.

New development is not a threat in this area; however, there is some concern regarding the impacts to Mill Creek from aging septic tanks. The USFS is investigating the situation by taking water quality samples and, if necessary, the appropriate mitigation plan will be prepared to address the specific situation.

3.4 Hydrology

Hydrology is the science or study of water, including its uses, control, and conservation and natural processes in the atmosphere, on the ground surface, and under the surface. Key hydrologic features of the Mill Creek Watershed include streamflows associated with winter storm runoff and spring/summer snow melt, the relationship between surface flows and groundwater, and streamflow diversions for agricultural purposes.

The USFS has been conducting a Watershed Analysis of Mill Creek which includes several sections related to hydrology, stream channels and riparian conditions, erosion processes, and water. Additional information regarding the Watershed Analysis is provided in the PACFISH discussion of this report (Section 5.2.E). The USFS will share the Watershed Analysis information with the Mill Creek Conservancy and the WAC as soon as it is available. The Watershed Analysis information will address the Forest land and private land and will be used by the USFS to consider appropriate amendments to the LRMP. The hydrology information developed by the USFS will be valuable to augment the Mill Creek Watershed Management Strategy Report.

For the purposes of this report, the key hydrology factors discussed are flows, diversions, water quality, and temperature. Additional information is needed to correlate all factors prior to developing a comprehensive water management strategy for Mill Creek.

3.4.A Flows

U.S. Geological Survey (USGS) discharge records have been collected since 1928 on Mill Creek 5.5 miles upstream of the confluence with the Sacramento River, near Los Molinos. In general, the record shows a watershed with peak flows dominated by rain and snow events. Of the top 10 discharge events since 1928 (Table 3-2), none are snow melt driven, with the latest occurring on February 28, 1940.

TABLE 3-2
Top Ten Discharge Events: Mill Creek at Los Molinos

		Monthly Precipitation (inches)			Monthly Snow Depth
Date	cfs	At Mineral	At Chester	At Greenville	At CSSL (feet)
December 11, 1937	36,400	15.85	7.57	8.36	--*
January 23, 1970	17,100	–	–	19.54	1.3
December 22, 1964	16,000	25.85	14.65	19.54	1.2
October 12, 1962	14,000	23.44	13.78	16.55	0

CHART ******

Storms, which local citizens recall as causing flooding and damage on a regional basis, show up on the top 10 list. These include the December 1964 storm, the Columbus Day storm of 1962, and the February 1986 storm. Of the top 10 discharge events, it is likely that all but the October 1962 event were rain on snow events (the October 1962 storm was likely a rain-driven event). Snow records were generally not available for these storms. Snow depths from the Central Sierra Snow Lab (CSSL) are available after 1951, the monthly snow depths at CSSL are given in Table 3-2, and there was a snow pack there for all storms after 1951 with the exception of the October 1962 storm.

The largest discharge occurred on December 11, 1937, and was twice the discharge of the second largest storm (December 1964). The largest storm was far above the gage height (maximum at that time of 14,000 cfs, and was first calculated by USGS at 23,000 cfs). This estimate was later revised to 36,400 cfs.

This is a huge flow relative to the size of the basin. Deer Creek, which has a basin size about 1.6 times as large as Mill Creek, has a recorded peak discharge of 23,800 cfs that occurred the day before the Mill Creek peak (December 11, 1937). Comparing instantaneous peak and mean daily values from records for which both are available (all storms but the December 11, 1937 event), a value of 21,800 cfs is estimated as the mean flow for December 11, 1937. This flow requires a runoff rate of 6.2 inches from the entire watershed.

The records indicate this was an extreme rainfall event but to generate the extreme runoff there must have been a substantial snowpack, probably to a fairly low elevation. Unfortunately, no snow records have been found to confirm this supposition.

Debris slides and other forms of mass wasting are episodic in nature, and are usually driven by extreme precipitation and runoff events. The December 11, 1937, storm may have been important in this regard, as would the other high discharge events.

Historical runoff by month in thousands of acre-feet for the period from 1921 to 1954 is provided in Table 3-3. Monthly average flow rates in cfs for the period from 1928 to 1994 along with a characterization of each water year as dry, normal, or wet, is provided in Table 3-4.

3.4.B Water Diversions

There are three diversions on lower Mill Creek. They are the Ward or Lower Diversion, the Clough Diversion, and the Upper Diversion. Both the Lower and Upper Diversion structures are owned and operated by the Los Molinos Mutual Water Company (LMMWC). The Clough Diversion is privately owned. All diversions have the legal right to divert flows from Mill Creek for irrigation purposes since the State Water Board fully adjudicated the creek at the turn of the century. Each diversion is entitled to a specific amount of water which is usually taken late spring through early fall. The diversions have been modified according to the Water Exchange Agreement discussed in Section 5.3.A.1.

Decree 3811, issued by the Superior Court of Tehama County, August 1920, adjudicated the rights of all users of the waters of the Los Molinos River (now called Mill Creek). The adjudication apportioned a total of the first 203 cubic feet per second (cfs) of the natural flows of Mill Creek to various beneficial users. For practical purposes, the section of the creek from the canyon mouth to the Sacramento River is considered fully adjudicated, therefore there are no additional flows to be allocated. The Court appointed the Los Molinos Land Company as Water Master for the purpose of executing the provisions of the Decree. Currently the Los Molinos Mutual Water Company is the Water Master for Mill Creek and manages the Upper and Lower diversions.

The Upper Diversion is entitled to a maximum of 123 cfs, the private Clough Diversion is allocated 20 cfs and the Lower Diversion is entitled to 60 cfs. These diversions can be modified per the Water Exchange agreement.

The CDFG's Red Bluff Fish Habitat Shop presently maintains a fish ladder and fish screen on each of the three diversions on Mill Creek. The upper Mill Creek diversion has a concrete pool and weir-type fish ladder, and the head of the diversion is screened by a 70-foot-long by 5-foot-deep, vertical, perforated flat-plate fish screen. The fish screen is mechanically wiped by a gang wiping system powered by a paddle wheel.

TABLE 3-3

Historical Runoff of Mill Creek Near Los Molinos

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
1921-22	6.9	6.4	18.7	14.2	39.1	28.6	32.4	44.5	25.6	8.8	6.1	5.4	236.7
1922-23	6.2	11.8	38.3	20.7	11.8	11.8	25.3	12.6	7.8	5.2	4.9	6.7	162.1
1923-24	7.5	6.4	7.2	7.9	20.0	12.3	9.9	6.2	5.1	5.1	5.2	5.0	97.8
1924-25	4.8	7.3	10.9	8.0	47.0	17.7	29.6	13.9	7.4	4.8	4.1	4.3	159.8
1925-26	5.0	6.8	8.7	12.2	37.0	15.0	42.6	10.4	5.1	4.2	4.0	3.9	154.9
1926-27	4.4	25.0	14.6	23.6	63.6	30.3	35.2	21.8	9.2	5.8	4.9	4.4	242.8
1927-28	5.3	17.2	11.5	12.5	23.4	67.6	27.2	14.5	7.9	5.3	5.0	4.4	201.8
1928-29	5.9	8.3	9.0	7.3	11.7	11.2	12.4	16.8	10.3	6.1	4.9	4.4	108.3
1929-30	4.7	4.5	31.9	22.6	19.8	26.6	22.8	19.6	13.3	7.3	5.6	5.6	184.3
1930-31	5.6	5.7	5.7	11.0	8.3	13.5	10.1	10.1	5.6	4.2	3.8	3.9	87.5
1931-32	5.5	5.5	23.4	12.3	9.9	17.6	20.8	26.7	16.7	7.3	5.0	4.5	155.2
1932-33	4.8	5.0	5.8	6.5	7.2	14.4	15.2	16.4	16.3	6.6	4.5	4.3	109.0
1933-34	5.0	4.9	15.9	14.1	16.9	18.1	15.4	10.4	6.6	4.6	4.1	4.0	120.0
1934-35	4.7	11.2	9.8	27.9	15.0	21.9	44.2	34.1	21.2	9.2	5.7	4.8	209.7
1935-36	5.5	5.2	7.0	32.1	38.2	18.2	26.3	24.5	17.9	9.7	5.9	5.4	195.9
1936-37	5.1	5.0	5.5	6.3	19.1	25.9	26.0	31.6	17.1	7.4	5.1	4.7	158.8
1937-38	6.9	28.5	64.6	20.7	54.3	62.2	40.3	56.8	39.7	18.5	9.7	7.9	410.1
1938-39	8.5	8.5	10.1	8.6	8.3	17.6	17.0	12.2	7.3	5.4	4.8	4.8	113.1
1939-40	5.6	5.2	10.6	42.5	65.5	55.4	30.6	26.5	18.3	9.1	6.4	6.6	282.3
1940-41	7.2	8.9	37.8	36.1	61.0	41.3	42.5	39.2	27.4	18.9	10.2	8.0	338.5
1941-42	7.7	10.0	54.1	44.1	48.8	18.0	37.8	35.4	29.7	18.2	9.3	7.6	320.7
1942-43	7.5	9.9	17.2	42.9	24.5	49.0	37.5	29.8	23.1	13.3	8.5	7.2	270.4
1943-44	7.7	7.6	8.0	9.8	16.2	20.0	17.6	22.6	14.9	7.8	5.9	5.3	143.4
1944-45	6.1	12.1	18.5	11.0	31.3	19.1	20.8	26.8	18.9	11.3	7.0	5.9	188.8
1945-46	8.5	13.6	48.0	21.1	11.4	17.6	26.4	28.6	16.1	9.4	6.4	6.0	213.1
1946-47	6.2	11.0	14.2	7.1	17.8	20.0	20.2	14.8	11.2	6.0	5.5	5.0	139.0
1947-48	10.5	10.2	7.2	21.4	8.0	23.8	43.3	35.8	34.8	14.6	8.4	6.7	224.7
1948-49	6.8	8.1	8.4	7.2	9.7	28.7	23.4	21.5	11.4	6.4	5.4	5.0	141.0

TABLE 3-3

Historical Runoff of Mill Creek Near Los Molinos

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
1949-50	5.4	5.9	6.1	18.1	27.7	19.1	29.5	29.0	18.5	10.6	6.5	5.7	182.1
1950-51	9.8	26.5	39.5	29.2	32.3	16.7	26.1	27.4	16.7	8.9	7.0	6.1	248.2
1951-52	7.3	12.2	35.2	30.7	42.6	29.9	42.0	52.0	33.1	20.1	10.1	8.0	323.2
1952-53	7.6	7.6	25.7	62.1	13.8	17.3	28.0	29.0	27.3	16.9	9.3	7.2	251.8
1953-54	7.7	11.3	9.8	20.4	28.5	33.6	44.7	29.6	18.3	10.8	8.2	7.6	230.5
Total	213.9	333.3	638.9	674.2	888.7	842.0	923.1	831.1	559.8	307.8	207.4	185.3	6,605.5
Mean	6.5	10.1	19.4	20.4	26.9	25.5	28.0	25.2	17.0	9.3	6.3	5.6	200.2
Percent	3.2	5.0	9.7	10.2	13.5	12.7	14.0	12.6	8.5	4.7	3.1	2.8	100.0

Values prior to October 1928, estimated by State Department of Water Resources in "Basic Data - Inflow to Delta from Sacramento Valley, Shasta-Folsom Mandatory Releases - Year 1956 - Volume 1."

Location: Sec. 6, T.25N., R.1W.
Record: USGS
Unit: 1,000 ac-ft
Drainage area: 134 sq. mi.

TABLE 3-4
Monthly Average Flow (cfs)

Type of Water Year	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
	1911					633	686	332	168	143	135	132	129
	1912												
	1928										95	140	147
Dry	1929	118	211	182	209	273	173	98.9	79.5	74.5	76	75	519
Dry	1930	368	356	433	384	318	224	119	91.3	94.8	90	96	93.3
Dry	1931	179	149	219	170	165	94.9	67.8	61.4	65.4	89	92	381
Dry	1932	200	172	287	350	434	280	118	81.2	75.9	78.4	84	94
Dry	1933	138	129	234	255	266	274	108	72.8	72	81	82	259
Dry	1934	229	304	294	259	169	111	74	67	68	76	189	160
Normal	1935	454	270	356	742	555	356	149	93	81	89	87	114
Normal	1936	523	664	297	442	398	300	158	96.5	91	83	84	90
Normal	1937	103	344	421	436	514	288	120	82.9	79	112	479	1,061
Wet	1938	336	978	1,012	677	923	667	300	158	132	138	142	164
Dry	1939	139	150	286	285	198	123	88	77.4	81	91	87	172
Normal	1940	691	1,138	901	514	431	307	148	104	111	117	149	614
Wet	1941	588	1,097	672	714	637	460	307	165	134	125	168	880
Wet	1942	717	878	294	636	576	499	297	152	127	122	166	280
Wet	1943	697	441	796	630	485	388	216	138	120	125	129	130
Dry	1944	159	282	325	296	367	250	127	95.7	89.3	99	204	301
Normal	1945	178	563	310	350	436	317	184	114	99.9	138	229	780
Normal	1946	343	205	286	443	466	270	153	104	101	101	185	230
Dry	1947	115	320	326	340	240	187	98	89	84	170	171	118
Normal	1948	348	140	288	728	583	585	238	136	113	111	138	136
Dry	1949	117	157	467	394	349	192	103	88	85	88	99	100
Normal	1950	294	498	310	496	472	310	172	106	95.6	160	445	642
Wet	1951	475	581	305	438	446	281	145	114	102	119	206	672
Wet	1952	500	740	486	705	846	556	327	163	134	124	127	418

TABLE 3-4
Monthly Average Flow (cfs)

Type of Water Year	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Wet	1953	1,010	249	282	471	472	460	275	152	121	125	190	160
Normal	1954	332	513	547	752	481	307	175	133	128	125	201	263
Dry	1955	199	170	207	289	398	254	128	97	93	95	137	1,278
Wet	1956	1,127	705	366	460	675	513	255	157	137	136	128	119
Normal	1957	148	507	486	306	521	322	160	114	161	227	217	333
Wet	1958	466	1,284	658	743	807	616	285	163	132	122	131	132
Dry	1959	444	526	271	314	266	201	118	95.3	108	99	95	102
Normal	1960	170	445	438	322	338	302	134	112	99	96	207	271
Dry	1961	210	511	330	331	338	341	148	108	93	93	130	282
Normal	1962	175	661	275	376	364	291	142	102	91	684	173	527
Wet	1963	341	665	356	854	567	322	163	121	111	118	270	143
Dry	1964	310	176	162	275	283	215	120	93	94	92	244	1,365
Wet	1965	823	316	286	719	448	382	209	157	118	108	217	176
Normal	1966	291	254	292	458	358	181	121	99	94	89	305	446
Wet	1967	610	367	504	512	810	661	294	144	121	130	139	179
Normal	1968	447	663	381	304	295	215	130	129	98	125	206	484
Wet	1969	1,271	671	355	582	813	487	233	140	121	138	159	797
Wet	1970	1,837	442	558	261	381	359	178	119	111	119	476	586
Wet	1971	476	262	559	409	512	466	265	147	127	126	136	203
Normal	1972	198	267	482	375	333	249	129	110	108	140	263	290
Wet	1973	684	618	386	403	555	304	152	118	113	136	1,039	648
Wet	1974	1,231	343	1,012	651	612	569	328	179	140	130	144	163
Normal	1975	163	610	663	394	676	557	252	158	128	160	174	166
Dry	1976	135	207	243	223	253	139	102	102	92	87	90	87
Dry	1977	96.8	98.6	107	112	122	99	72	67	86	82	105	299
Wet	1978	902	532	786	616	490	449	253	137	121	105	109	111
Dry	1979	192	443	377	318	446	239	127	107	90	161	219	367
Wet	1980	982	871	417	341	423	311	204	122	107	106	106	225

TABLE 3-4
Monthly Average Flow (cfs)

Type of Water Year	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Dry	1981	390	310	359	275	283	162	98.9	83.6	83.8	152	959	706
Wet	1982	444	677	549	862	569	406	250	149	134	205	332	539
Wet	1983	632	885	1,278	545	710	736	456	230	168	160	535	1,080
Wet	1984	385	333	398	328	428	342	198	142	129	144	315	203
Dry	1985	145	224	224	323	237	160	113	99	122	112	179	180
Wet	1986	378	1,744	817	368	397	321	188	121	136	129	123	121
Dry	1987	185	320	592	286	289	134	102	88	86	87	98	320
Dry	1988	345	177	207	238	229	195	111	88	82	85	175	139
Dry	1989	186	173	993	452	300	256	132	105	114	171	132	116
Dry	1990	254	188	263	214	227	208	109	94	96	87	96	95
Dry	1991	100	125	472	269	243	195	111	84	77	85	105	118
Dry	1992	140	474	282	284	201	110	86	65	67	125	203	345
	1993	424	467	443	431	436	325	174	116	106	123	117	227
	1994	174	291	252	220	252	148	91	75	76			
	Avg.	416.08	462.6	434.87	426.65	430.07	318.20	171.01	114.40	104.96	126.48	204.44	349.21
	USGS	420	465	439	430	433	321	172	115	105	126	205	348
	Wet	655.43	662.47	546.69	550.60	573.95	443.30	243.47	142.13	121.08	124.82	217.86	323.60
	Dry	203.75	254.10	325.68	285.8	275.76	192.67	107.15	87.188	86.856	102.03	165.78	319.84
	Normal	303.62	483.87	420.81	464.87	451.31	322.31	160.31	112.01	104.9	159.85	221.26	402.93
	Passage	240	240	240	240	240	240	240	240	240	240	240	240

The Clough Diversion has a concrete pool and weir fish ladder with 10 pools that rise 20 feet. The diversion ditch is screened by a 20-foot-long by 3-foot-deep vertical-diagonal fish screen with a paddle wheel powered reciprocating gang wiper.

The Ward Diversion (Lower Diversion) has a ramp with a rise of 6 feet and a fish weir ladder with six pools. The diversion is screened by a 60-foot-long by 4-foot-deep inclined-diagonal, perforated flat plate screen with an optional trap or direct fish bypass. The screen is cleaned by an electrically powered reciprocating gang wiper. The water diversion locations are shown on Figures D-2, D-3, and D-4 in Appendix D.

3.4.C Water Quality

Water Quality standards for the Sacramento River Basin are under the purview of the California Regional Water Quality Control Board, Central Valley Region. The current Water Quality Control Plan (Basin Plan) for the Central Valley Region, which includes the Mill Creek watershed, was adopted in 1994. The standards apply to surface and ground water.

Table II-I of the Basin Plan indicates that Mill Creek surface water "existing beneficial uses" are: domestic supply, agricultural uses including irrigation and stock watering, recreational uses including contact and non contact recreation (no canoeing and rafting), freshwater habitat including warm and cold water habitat, cold water migration, warm and cold spawning water, and wildlife habitat. There was no designation of industrial water uses or navigation uses of the surface water.

The Basin Plan also includes Water Quality Objectives for Inland Surface Waters

The water quality categories that pertain to Mill Creek are:

- Bacteria
- Chemical Constituents
- Dissolved Oxygen
- pH
- Pesticides
- Sediment
- Settleable Material
- Suspended Material
- Temperature
- Toxicity - (to be studied per the Sacramento River Toxic Pollution Program)
- Turbidity

Several agencies test for various of these components of water quality including the California Regional Water Quality Control Board, Central Valley Region, Department of Water Resources, California Department of Fish and Game, USFS, and the LMUSD. Specific requirements for the Water Quality Objectives for Inland Waters contained in Appendix F.

The water quality in Mill Creek differs from other eastside Sacramento River tributaries in that it is characterized by its high silt load and turbidity during the spring snow melt period (CDFG, 1993). Much of this silt originates from naturally occurring volcanic ash and glacial till in Lassen Volcanic National Park. Additional silt enters Mill Creek from Lassen National Forest and private lands. Timber harvest, road construction, and cattle grazing in the forest

is cited as contributing this additional siltation (CDFG, 1993). However, those activities are not significant factors at this time in the upper and middle watershed because there is no timber harvesting (except minor salvage operations), road building, and grazing is limited within the Mill Creek Watershed. Water quality within the Lassen National Forest is currently maintained and improved through the application of state-certified and EPA-approved Best Management Practices (BMPs) for controlling nonpoint sources of pollution to surface water. Methods and techniques for applying the appropriate BMP are identified during onsite investigation of forest projects that have the potential to degrade surface-water quality.

Within Lassen National Forest, water quality in streams and lakes is acceptable; however, there are existing and potential water quality problems (USDA, 1992). In the LRMP, USFS has identified some subwatersheds of Mill Creek as occasionally approaching the 15 percent equivalent roaded area (ERA) threshold for accelerating damage. ERA is the amount of disturbance equivalent to that produced by new road construction. These disturbed areas are potential sources of erodible sediments that have the potential to degrade the water quality in Mill Creek. The Meadowbrook study, due to be completed in January 1997, should provide more specific information regarding the location of potential sources within the Mill Creek Watershed.

The single most significant water pollutant, by volume, in the world today is sediment. Sediment is generated from soil erosion that is natural or geologic caused and is also accelerated by human factors. It is generally accepted or promoted that human caused excessive erosion should be reduced whenever possible. Eroded soil or sediment can result in many other resource problems such as flooding, increased streambank erosion, impacts to wildlife, transports pollutants into streams, and other resource concerns.

Water quality information for Mill Creek is sparse. The Mill Creek Water Quality Monitoring Project has recently been established. Through the Partners in Education program, the Lassen Watershed Project and LMUSD, a water quality monitoring program has been developed to collect monthly water quality data in the lower reaches of Mill Creek. Two locations have been identified for collection of dissolved oxygen, total phosphates, total nitrates, temperature, pH, turbidity, total dissolved solids, fecal coliform, and biochemical oxygen demand. These locations are in Los Molinos approximately 4 miles east of Highway 99, and approximately 1 mile west of Highway 99. Data are collected on field forms, transferred to computer spreadsheets, and archived for future analysis.

Water temperature is one of the most limiting water quality factors for lower Mill Creek. CDFG (1993) identified that low stream flows created increased temperatures/thermal barriers that delayed or prevented salmon and steelhead migration within Mill Creek. The Upper Sacramento River Fisheries and Riparian Habitat Management Plan identified long-term measures to improve temperature conditions for salmonid species (The Resources Agency, 1989). In addition, CDFG identified a need to investigate the flow-temperature relationship for Mill Creek (CDFG, 1993).

Temperature data corresponding to the summer flow data in Table 3-5 are provided in Table 3-6. These temperatures are the recorded maximum during the months of July and August for the years 1963-64 and 1992-95. The average July/August maximum temperatures are shown in parentheses.

TABLE 3-5
Summer Flow Data for 1963 -1964 and 1992 -1995

Year	Month	Mean Q[a] (Mean July Flow over period of record = 173)
1963	July	163
1964	July	120
1992	July	86[b]
1993	July	280
1994	July	91
1995	July	422

[a]Mean Monthly Discharge (cfs) (USGS gage at Los Molinos).
[b]Lowest July mean flow on record (1928-1995).

TABLE 3-6
Mill Creek July/August Water Temperatures in Spring-Run Chinook Holding Habitat

Year	Station			
	Little Mill	Black Rock	Big Bend	Hwy. 36
1963	70[a] (67)	65 (61)	--	--
1964	--	--	--	72 (69)
1992	--	71 (66)	71[b] (67)	--
1993	--	64 (60)	64 (60)	--
1994	--	--	68 (63)	--
1995	--	62 (59)	63 (59)	--
1996 (by end of Sept.)				

[a]No data collected from July 1 through August 5.
[b]Data collected at Hole in the Ground.
-- No temperature data collected.
Data Sources: 1963-64: J. M. Hayes, 1965; 1992-95: CDFG, IFD, Red Bluff.

These water quality measurements are probably not typical of the water quality characteristics of Mill Creek as they were collected during the 1976-1977 drought period. However, they represent temperature and sediment quality during an extreme low flow period. Representative water temperatures measured during active fall-run chinook salmon adult migration in lower Mill Creek in 1995 ranged from 56.0°F (12.2 C°) on October 18 to 46.0°F (7.8°C) on November 3 (Alley, et al., 1996).

The DWR Northern district, Water Quality and Biology section has a monitoring station near the mouth of Mill Creek at Highway 99 in Los Molinos. This station has been sampled on an irregular basis over the years as part of the Water Quantity and Quality Monitoring Program. Since 1995, it has been sampled bi-monthly. A review of the data collected from 1988 to the present was conducted to prepare this description.

Discussions of other water quality characteristics of Mill Creek including conductivity, dissolved oxygen, alkalinity, turbidity, mineral levels, nutrients, and minor elements are provided in Appendix H.

3.4.D Description of Groundwater Basin

The Mill Creek Watershed boundaries encompass three key areas noted in the preliminary draft District AB 3030 plan. Preliminary, Mill Creek is assumed to act as a "recharge" or "constant flow" boundary relative to regional groundwater movement. Therefore, two groundwater "subbasins" (smaller components of the Sacramento Valley Groundwater Basin), the Los Molinos Subbasin and the Dye Creek Subbasin, underlie the Mill Creek Watershed in the valley floor areas of the stream drainage area. The upland areas of the watershed fall within the "Eastern Tuscan Formation Highland Area."

The Los Molinos Subbasin is bounded on the north by Mill Creek and on the south by Deer Creek (both groundwater recharge boundaries), on the east by the Chico Monocline, and on the west by the Sacramento River. The Dye Creek Subbasin is bounded on the north by a topographic high, on the south by Mill Creek, on the east by the Chico Monocline, and on the west by the Sacramento River. Groundwater flow is westerly from Mill and Deer Creeks toward the Sacramento River.

The highlands area of the watershed is bounded by the Tehama County line to the east and the Chico Monocline to the west. The area is mostly underlain by volcanic rock, which yields water at shallow depths in fractured zones.

3.5 Riparian Vegetation

The rapidly flowing, well-aerated middle and upper reaches of Mill Creek are dominated by a conifers and white alder/riparian forest. This forest is characterized by multi-layered strata of tree, shrub, and herbaceous layers. The common occurring species include white alder, cottonwoods, various willows, and bigleaf maple. The riparian corridor in these reaches is narrower than on the valley floor because of the steep sided canyons. Swift stream flows limit lateral movement of water reducing the width of riparian forest. Substrates are dominated by coarse materials (large cobbles) indicating high stream velocities during spring runoff.

The vast majority of the portion of Mill Creek downstream from Blunkall Crossing to the mouth of the canyon is characterized by flood-scoured walls of bare volcanic rocket with only isolated pockets of streamside vegetation. This flood plain represents the low gradient portion of Mill Creek. The canopy layer is dominated by western sycamore, Fremont cottonwood, and California black walnut. Understory consists of Himalaya berry, box elder, mugwort, and California wild grape. Thickets of willows are interspersed in the understory and found along the gravel bars and sandy deposits within the riparian band. Outer edges of the riparian forest band also contain valley oaks. The extent of this mixed riparian forest along the valley floor is extensive but has been reduced and replaced from that of historical periods by agriculture.

The botanical resources are rated as very good to excellent in the middle and upper reaches of Mill Creek. This rating is supported by the generally wild and undisturbed quality of the riparian forest and the diverse variety of plants supported in this area.

Riparian systems indirectly enhance human habitats by increasing the beauty of an area, but they are especially important to wildlife. Many species of wildlife use stream channels as safe corridors between upland and valley floor habitats, for nesting and rearing young,

water, cover, and lower air temperatures. Healthy riparian systems also directly enhance human habitat by:

- Reducing air temperature in the area
- Increasing water quality, as riparian systems act as buffer zones to clean and filter water
- Preventing bank erosion, as riparian root structures hold soil best

The State of California in its 1989 Upper Sacramento River Fisheries and Riparian Management Plan (The Resources Agency, 1989). Recommendations included establishing land use agreements with private landowners in Tehama County to restore and protect existing riparian vegetation along Lower Mill Creek and develop programs to produce additional riparian habitat. The U.S. Fish and Wildlife Service (USFWS) has determined that encroaching residential development near Los Molinos on Mill Creek's riparian corridor has, through cumulative impact, significantly degraded the habitat in the lower creek (USFWS, 1995).

The USFWS has identified the following potential solutions to restore chinook salmon and steelhead habitat in Mill Creek:

- Work with local government to ensure protective zoning or ordinances for the Mill Creek riparian corridor.
- Restore riparian vegetation along the lower 8 miles of Mill Creek.

The project recommendations support and carry out the USFWS solutions. The revegetation committee, during the course of the Scoping Study sessions, has obtained a grant to pursue restoration projects on lower Mill Creek. This grant reinforces our implementation plan by providing additional financial resources to pursue restoration projects and allows involvement of the Los Molinos students. In addition, the Mill Creek Conservancy has been pursuing a riparian corridor ordinance for Mill Creek.

3.6 Wildlife

The wildlife of the Mill Creek Watershed is quite diverse, corresponding to the diversity of habitat types. The upper elevational reaches are characterized by conifer-dominated habitats with chaparral, blue oak woodland, and riparian vegetative types to be found as the elevation decreases.

Common mammal species include black bear, mountain lion, coyote, raccoon, bobcat, gray fox, squirrels, and a number of other small mammals. The entire watershed is part of the range of the East Tehama Deer Herd, historically the largest herd in the state. Occasionally elk and pronghorn have been sighted. The American marten, on the UFSF "Sensitive" list, is found in the area. The American marten and the California Spotted Owl are known to inhabit critical habitat areas within the Mill Creek old growth forest area. Special regulations are being developed to protect these species on public lands through the CAL OWL and forest management practices.

Common birds include California Valley quail, great blue heron, golden eagle, scrub jay, and acorn woodpeckers. A number of species on various lists (Threatened, Endangered, Special Concern, etc.) are found in the Mill Creek Watershed. These include bald eagle,

peregrine falcon, osprey, northern goshawk, spotted owl, Lewis' woodpecker, pileated woodpecker, willow flycatcher, and western bluebird.

The foothill yellow-legged and red-legged frogs are two species of amphibians currently under study by federal agencies to determine possible ranges within the watershed.

Spring-run chinook salmon, winter-run steelhead, rainbow trout, brown trout, and fall-run chinook salmon all reside in Mill Creek. Each species has a specific life cycle that corresponds to the habitat conditions where they are successful. Trout are a popular game fish and the wild rainbows are plentiful in Mill Creek. Spring-run chinook salmon and winter-run steelhead numbers have declined steadily in the past 35 years and are discussed in greater detail in Chapter 4. A detailed special-status species list is provided in Appendix I.

3.7 Erosion Potential

The Mill Creek Watershed has a pinnate drainage network, where parallel first-order tributaries flow from steep slopes flanking the main stem channel. Many slopes are greater than 30 percent. Pleistocene glaciers left areas of unconsolidated till and steepened valley walls in the upper watershed, which lies within the Lassen Volcanic National Park.

About a third of the basin is in soils with high or very high erosion rates. The erosion potential in the basin is driven by slope, with moderate potential on the plateaus and ridge tops and high rates on most slopes greater than 30 percent.

Soils within the watershed are highly variable. They are formed primarily from volcanic rocks, although there are also sedimentary- and metamorphic-based soils, especially in the lower basin. Soils that are derived from rhyolite and from basalt-andesite breccias have the highest erosion potential, especially on slopes greater than 30 percent. On the rhyolitic soils, gullying follows increased runoff and is a primary erosion source. Other erosion sources are channel banks and areas of mass wasting. Channel banks in the main stem are generally extremely stable below Mill Creek Tract. The main stem above that point is depositional and sensitive, and is and has been a sediment source. Some steep canyon slopes, predominantly on Hulls Series soils (metamorphic schist) are prone to mass failure in the form of debris slides. One such slide occurred as recently as 1995 near Black Rock.

Other sources of accelerated erosion in the watershed are roads, timber harvest areas, burned areas, damaged riparian or streambank areas, and other localized sites (e.g., recreation sites, residences). Disturbed sites are characterized primarily by removal of protective vegetative cover, excavation activities or other activities that reduce soil infiltration, and increased surface runoff. Natural soil disturbance includes landslides and burned areas which may result in additional sedimentation.

3.7.A Extent and Pattern of Road Development

Overall road density in the Mill Creek Watershed is relatively low compared to most actively managed watersheds. The upper watershed above Highway 36 is mostly unroaded except for Highway 89 through Lassen Volcanic National Park and a few relatively minor roads. The highest road density is found in the section between Highway 36 and Hole In the Ground Campground. The one area where road density and configuration may be of concern is on the Mill Creek Plateau south of Doe Mountain and southeast of the Mill Creek

Resort. Here the terrain is steep and highly erodible and has a system of "stacked" roads accessing the steep flank of the hillside. South of Hole In the Ground, the watershed is virtually unroaded with only minor exceptions.

On public land, Mill Creek flows through three roadless areas, most of which are protected as designated or recommended wilderness areas. This large amount of roadless area may account for the pristine nature of the watershed. In addition, the project recommendations to reduce sedimentation, erosion, and soil disturbance may support some road closures and repairs. Also the recommendation to manage undeveloped areas as biotic reserves is consistent with the retention of roadless areas to prevent encroachment on habitat.

3.7.B Erosion Potential/Impacts in the Lower Watershed

The foothill or middle area of the watershed is characterized by shallow soils formed primarily from volcanic rock. These soils are generally steep with slow permeability, low water-holding capacity, and low fertility. Most are underlain with hardpan, clay, or other restrictive layers. The significance of these factors being that although soil erosion hazard is on the whole not a serious concern unless severely disturbed, runoff is plentiful and rapid. This makes for rapid high flows within a short period of time. Luckily, through the middle of the Mill Creek Watershed, the streambanks are stable having been carved out of bedrock or other relatively hard unconsolidated material. A heavy downpour within the middle reach of the watershed can result in high and turbulent flows through this canyon area without significant resource impact. The only serious natural erosion threat that might occur within the middle foothill part of the watershed would be a catastrophic landslip/ landslide.

The soils of the valley floor are very deep to shallow and are nearly level. Without significant removal of vegetative cover or disturbance, erosion hazard on these soils is slight. Erosion as a result of over irrigation is rare. Unless the topography becomes steep, even road or building disturbance does not result in uncontrollable erosion. Moderate application of BMPs can usually protect disturbed areas on the valley floor from accelerated erosion problems.

Streambank erosion along the lower valley portions of Mill Creek presents a significant concern and challenge. Some streambank areas of the creek are almost naturally protected by a hard almost cemented like parent material. These areas are dominated by large round rock, deposited eons ago and cemented together as a result of deposition of fine soil particles, pressure, and time. Although not entirely impervious to the impacts of water flow, these streambanks remain relatively stable, even at a nearly 1:1 slope gradient. Unless these streambank are severely disturbed by human activity or landslide, they will remain stable. On the negative side, this hard material is not likely to support riparian vegetative growth either.

Other areas along the lower valley portions of Mill Creek are dominated by fine-textured soils that can be significantly impacted by erosion. These are generally more fertile soils that are used for intensive agricultural crops (orchards), irrigated pasture, and home sites. The use of drip and sprinkler irrigation systems usually precludes any irrigation induced erosion problems. A few flood irrigated areas could benefit from application of BMPs to control excess runoff, especially adjacent to the Mill Creek streambank. Vegetation serves as a buffer to protect erosive soil from the flows of the creek and to slow and control surface

runoff into the creek. Vegetation serves as a filter to prevent sediment and soil borne contaminants from entering the stream and impacting water quality. Riparian vegetation is most commonly removed by human impacts (e.g., home, road building, harvest), livestock, and high water flows. High water flow impacts are often exaggerated by buildup of non-native plants within the center of the stream channel. Restoration or repair of eroded streambank is open to debate. Some discount the overall impact of erosion as not significant while others suggest that the most significant impact is from flooding. Regardless of what people believe is the most significant impact, there exists expertise, methodology and potential funding sources for solving these erosion problems.

The Mill Creek Conservancy and some land management agencies promote the use of native vegetation whenever possible to solve erosion problems. Restoration of vegetation is often the least expensive and most environmentally suitable alternative solution to stream-bank erosion control. While the use of vegetation to solve erosion problems along the edges of the creek can be useful, a clear channel should be maintained to reduce flooding to surrounding land and the community. Other mechanical solutions are also available and used. To an unknown extent, a diversion structure at the confluence of the North and South Forks of lower Mill Creek, may result in higher than normal flows into the South Fork. Some have suggested this "extra flow" has increased erosion. The total extent of erosion and potential for restoration remain unknown until a complete stream survey is completed.

3.7.C Importance of Soil and Geology

Preliminary results of the Meadowbrook Road survey indicate that the most significant difference on road erosion rates is related to soil type. Roads on rhyolitic soils have erosion rates 10 to 15 times that of roads on the other volcanic soil types. Areas with rhyolitic soils have erosion rates as high as 50 to 70 yd^3 per mile of road. Guidelines should be developed for roads in rhyolitic soils where erosion has the potential of harming the creek.

3.7.D Importance of Topography

Landform appears to be the next most important factor controlling sediment contribution from roads. As one might expect, roads located on ridgetops and plateaus have the lowest aggregate erosion rates and the fewest stream crossings. Midslope locations show the next highest erosion rates. Lower slope (defined as slopes within 200 feet of a perennial stream) and inner gorge topography exhibit the highest road erosion rates. Roads on alluvial fan (toeslope) topography exhibit moderate erosion rates, but require high maintenance because of the disproportionate number of stream crossings. Roads in meadows are not showing high erosion rates, but the proportion of the database in this type is small.

3.7.E Road Erosion Control

The USFS collected existing road condition data in 1993. The ongoing assessment by Meadowbrook Conservation Associates will be combined with the existing survey to provide a basis for identifying road improvement/management/closure opportunities.

An excellent summary of road erosion control measures is provided in the American Fisheries Society Special Publication No. 19 "Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats." These measures include:

- **Location, Relocation.** Avoid, in new construction, oversteepened slopes and other areas prone to mass wasting. Where feasible, relocate existing roads that occupy such landforms.
- **Road Surface.** On highly erosive soils where road gradients are steep (6 to 8 percent) apply rock to road surface. This may also apply on other soils with steeper gradients, or roads with year-round traffic.
- **On All Road Surfaces, Provide Proper Drainage.** Outsloping is the preferred alternative as it requires low maintenance. The other alternatives involve cross drains. These may be either dips (or water bars), or drainage to an inside ditch with appropriate relief through culverted cross drains.
- **Road Fills.** Vegetative cover is the control measure. In the short term, slash, mulch, or netting may provide cover until vegetation is established. The need for vegetative cover is dictated by the location of the road in relation to drainages, the height of the fillslope, and the erosion potential of the soil.
- **Crossing.** Failure of pipes with subsequent wash out of the fill prism are a major source of sediment. Control measures include proper sizing of pipes, use of pipe inlet structures, use of fords, low water crossings or bridges in lieu of culverts, and pulling culverts on temporary or seldom used roads. Proper design of road crossings to prevent road capture of streamflow during washout is critical. In addition, control of surface drainage to the crossing, and control of erosion off the crossing fill are also important. Erosion losses from crossings have a 100 percent stream delivery potential.
- **Control of Traffic During Wet Periods.** Unsurfaced forest roads may function well as constructed, only to have drainage features ruined by wet weather traffic. Seasonal closure of roads susceptible to such damage is an excellent erosion control measure.

3.7.E.1 Preliminary Estimate of Erosion Rates

Erosion tends to be an episodic process driven by heavy runoff periods that may occur every 5 to 10 years (or more) on average. The figures cited below are estimates of total gross erosion that has occurred since the last major runoff event, which we assume to be 1993. Erosion features from earlier events are more likely to have been repaired or otherwise bladed over. As a practical matter, it is usually not possible to tell if an erosion feature resulted from 1993, 1986, or earlier runoff events so it becomes necessary to make such assumptions. The purpose of this explanation is to clarify the meaning of erosion rates presented in this strategy report. They are NOT annual rates, but rather the rate of erosion for the period since the last major runoff event. The erosion rates reported here cover a period of approximately 3 years:

- Roads on rhyolitic soils are averaging 29.7 yd^3 per mile of road with the highest average rate (70.7 yd^3 per mile) occurring on *toeslope* and *inner gorge* topography.
- Roads on andesitic soils are averaging 4.88 yd^3 per mile with a maximum average rate of 41.6 yd^3 per mile occurring on *lower slope* topography.
- Roads on meadow soils (recent alluvium) are averaging 3.0 yd^3 per mile.

Past experience indicates erosion rates on the order of 2 to 6 yd^3 per mile can be considered average for unsurfaced forest roads in typical settings. Using this as a guideline, one can see that rhyolitic soils present an unusual challenge in maintaining a stable road system.

The proportion of the total estimated to enter the stream system (and potentially impact aquatic habitat) is currently estimated at 40 to 45 percent.

3.7.E.2 Recommended Improvements

The following problems are the most frequently occurring and are responsible for most of the road-related sediment contribution to Mill Creek. They are listed in descending order of importance:

- Inadequate cross drain spacing. Leads to ditch erosion or gulling of roadbed and fill slope.
- Stream crossing culverts that are undersized or plug with sediment.
- Hillslope runoff from rock outcrop areas or skid trails that are intercepted by the road prism.
- Entrenched roads with no practical way to cross drain—streamflow conveyed by road ditch.

A staged but systematic upgrade of roads as areas are entered for timber harvest or other activities could address road problems over the long term without immediate and overwhelming outlay of capital.

The above findings are preliminary and subject to revision as the survey progresses. A final Road Inventory Report with specific information regarding Mill Creek will be available January 1991.

3.8 Fire History

A creation of a Fire History is an important element of developing a comprehensive Watershed Management Strategy for Mill Creek. Fire has played a role in the types of vegetation which is successful in the watershed. In recent history, people have influenced significant control over the natural environment by suppressing fires. The WAC Fire subcommittee sought information and support from Lassen Volcanic National Park, Lassen Forest Service, California Department of Forestry, and private landowners. The Fire subcommittee is in the process of developing additional information regarding specific Fire History and recommendations for future fire management policies.

The area within the Lassen Volcanic National Park that is defined as the Mill Creek drainage includes the east and west forks of Sulfur Creek and the un-named creek system that drains from Forest and Ridge Lakes.

From 1931 (the beginning of Park fire records) to the present, records show approximately 36 fires within the watershed at the headwaters of Mill Creek (see Table 3-7).

TABLE 3-7

Fires Within the Watershed at the Headwaters of Mill Creek

Year	No. of Fires	Year	No. of Fires	Year	No. of Fires
1994	3	1992	2	1989	3
1988	3	1987	2 (1[b])	1986	1
1984	1[a,b]	1981	2	1980	1
1979	1	1978	2	1977	1
1976	1	1970	1	1964	1
1963	1	1961	1	1960	2
1958	1	1956	1	1946	1
1937	1	1936	1	1935	1[a]
1934	1				

[a]Class B Fire (.25 to 9.99 acres).

[b]Denotes a Prescribed Natural Fire.

From 1931 to 1982, Lassen Volcanic National Park, like the adjacent Lassen National Forest, had employed an aggressive suppression policy. The overwhelming majority of these fires were managed under a "control" suppression response. Since 1982, the Park has managed both a suppression and prescribed natural fire program. From 1982 to the present, there were two prescribed natural fires within the Mill Creek Drainage. From 1931 to the present, the Park has not conducted any "Management Ignited prescribed fires" within this area of the Park. Only two fires were above .25 acres in size, with none exceeding 10 acres.

Other fires within the watershed are listed below and depicted on Figure D-7 (Appendix D).

- McKenzie Fire—October 1936 burned 600 acres in Dye and Mill Creek canyons
- Mill Creek Fire—June 1943 burned 9,000 acres in Mill and Deer Creek canyons
- North Mill Creek Fire—June 1944 burned 1,000 acres in Dye and Mill Creek canyons
- Camp_____ Fire—August 1990 burned 39,000 acres in Deer, Dye, and Mill Creek canyons
- Barkley Fire—September 1994 burned 12,462 acres in Deer and Mill Creek canyons.

The Barkely Fire occurred in 1994 within the middle stretch of Mill Creek in the Ishi Wilderness area. No salvage operations were allowed within the Mill Creek Watershed. Observations made in fall 1996 indicate ground cover is returning to burn areas.

3.9 Historical Perspective of Human Uses

A detailed description of historical uses in the Mill Creek Watershed is provided in Appendix J.

3.10 Data Gaps and Needed Actions

1. Need current land use map for entire watershed (GIS being developed)

2. The Tehama County General Plan needs to be review, updated/amended to reflect resource management direction for the watershed

3. Develop more information on vegetation and wildlife.

4. Improve hydrology by adding the following:

   - Water use characteristics in the watershed (agricultural, etc.)
   - Growth characteristics in the watershed
   - Historic water demand
   - Existing water rights
   - Surface water resources
   - Groundwater resources
   - History of water rights/adjudication
   - Groundwater Quality Monitoring
   - Causes of erosion in upper and lower watershed

5. Hydrology discussion can be easily complimented by accompanying tables and figures. Typical hydrologic tables include the following:

- Significant water users
- Summary of existing water rights
- Summary of stream gage measurements (min., max., mean, etc.)

6. Suggested figures include:

- Monthly average water demand
- Water balance, showing typical inflows and outflows from watershed
- Typical monthly streamflow

SECTION 4.0

Anadromous Fish Population And Habitat Conditions

The Scoping Study sessions have included discussions regarding maintaining and improving the integrity of the spring-run chinook salmon and steelhead habitat. These two special species are under intense scrutiny from many sectors. The spring-run chinook salmon and steelhead are remnants of past healthy self-sustaining populations. The WAC has adopted the ecosystem approach to addressing the entire watershed; however, the anadromous fish are considered a key indicator to the health of the entire watershed. This section highlights the Mill Creek Watershed, which provides holding, spawning, and rearing habitat. Survival of the fish are dependent on all segments of the system that includes the main stem of the Sacramento River, the San Francisco Bay Delta, and the Pacific Ocean. The commercial and sport fishing industries are also mentioned in this section.

4.1 Status of the Tributary

4.1.A Spring-Run Chinook Salmon

Mill Creek provides habitat for three types of anadromous salmonids: spring-run chinook salmon, winter-run steelhead trout, and fall-run chinook salmon. Mill Creek is one of the last streams in the Central Valley supporting a self-sustaining run of spring-run chinook salmon. Historically, this salmon run may have numbered a million or more fish per year throughout the Central Valley, but is now only found in a few tributaries in the Sacramento Valley; Mill Creek is one of them.

The most serious threats to these fish lie outside the watershed rather than within the watershed, the chief need is to maintain unimpaired migration for adult and juvenile salmon as they ascend and descend the stream on their journey from and to the ocean. During late spring, when the adult salmon are migrating to their spawning grounds, water diversions located below the mouth of the canyon are capable of completely dewatering the stream or reducing the flows to such a low volume that upstream migration is impossible. Cooperative agreements between DWR, CDFG, and Los Molinos Mutual Water Company (LMMWC) have partially resolved this problem. The LMMWC, in exchange for groundwater pumped at the state's cost, has agreed to release water for salmon migration purposes. While this arrangement does not mimic the historic natural flow, it has proven to be effective in moving the fish from the valley floor to the deep, cold pools in the mountains.

In the past, the CDFG stocked catchable trout in areas where adult spring-run salmon were found. It was believed this practice could negatively impact adult salmon and stocking was discontinued. The angling regulations were also changed to minimize risk to salmon. Bait and barbed hooks were previously allowed, but now angling regulations restrict anglers to the use of artificial lures with single barbless hooks and a zero bag limit for salmon and

Spring-Run Chinook Salmon Counts on Mill Creek from 1947 through 1995steelhead in the reach from U.S. Geological Survey gauge to the Lassen Park Boundary, from the last Saturday in April to November 15. Different regulations regarding gear and open season apply to the lower reach from June 16 to September 30 without gear restriction. Check your fishing regulations.

Adult spring-run chinook salmon holding and spawning habitat ranges from the Little Mill Creek confluence upstream to near the Lassen Volcanic National Park boundary. CDFG has no records showing the actual distribution of holding and spawning of spring-run chinook salmon within the Mill Creek Watershed. Population estimates for spring-run chinook salmon have been made on Mill Creek since 1947. Table 4-1 provides the spring-run chinook salmon counts on Mill Creek from 1947 through 1995. During this time period, the population has ranged from a high of 3,500 to a low of less than 100 spring-run chinook salmon. The estimated average run size from 1947 through 1996 is 1,268 spring-run chinook salmon. The average spring-run population since 1990 is _____.

4.1.B Fall-Run Chinook Salmon

Adult fall-run enter Mill Creek to spawn in early October and continue into December. Fall-run chinook salmon spawning habitat ranges from Mill Creek's confluence with the Sacramento River upstream as far as Little Mill Creek (approximately 14 miles to an elevation of 1000 feet). The majority of this spawning habitat is in the lower 6 miles of Mill Creek.

Population estimates for fall-run chinook salmon were made on Mill Creek from 1952 through 1994. Estimates ranged from 16,000 (1952) to 150 (1965) salmon. The average run size during this time period was 2,126 fall-run as indicated in Table 4-2. Because of personnel cutbacks and a change in access requirements for private land, CDFG no longer monitors adult fall-run chinook salmon populations in Mill Creek. Also, fall-run chinook salmon are considered a self-sustaining population without immediate threats to decline.

Escapements of Sacramento fall-run salmon relative to amount harvested have declined in recent times. Spring-run abundance has declined more than fall run suggesting that limiting factors other than fishing are dominant. It is generally thought among fisheries scientists that if 70 percent of the fall-run salmon are harvested then about 50 percent of the spring-run salmon will be harvested. This difference is due to differing life histories, which lessen the exposure of spring-run salmon to harvest.

Although late-fall run salmon may occasionally stray into a tributary such as Mill Creek and spawn, the life history patterns of this run of salmon is adapted to larger river systems with cooler spring and summer water temperatures such as the main stem Sacramento River. Adult late-fall run salmon spawn from January through early April. Fry emergence occurs from April for the earlier spawners through July. The water temperatures in tributaries is usually lethal for eggs and emerging fry this late in the season.

4.1.C Winter-Run Chinook Salmon

There are no winter-run chinook salmon in Mill Creek. Adult winter-run salmon spawn in May, June, and July. The water temperatures in Mill Creek, both in the valley and headwater areas is lethal to salmon egg incubation at this time of year. Both spring-run and

TABLE 4-1
Spring-Run Chinook Salmon Counts - Mill Creek from 1946 through 1995

Year	Spring Chinook	Year	Spring Chinook	Year	Spring Chinook	Year	Spring Chinook	Year	Spring Chinook	Year	Spring Chinook
1947	3,000	1950	2,000	1960	2,368	1970	1,500	1980	500	1990	844
1948	2,000	1951	300	1961	1,245	1971	1,000	1981	Few (15)	1991	319
1949	1,200	1952	2,100	1962	1,692	1972	500	1982	700	1992	61
		1953	3,485	1963	1,315	1973	1,700	1983	NA	1993	723
		1954	1,789	1964	1,628	1974	1,500	1984	191	1994	320
		1955	2,967	1965	--	1975	3,500	1985	121	1995	252
		1956	2,233	1966	--	1976	Few (87)	1986	291		
		1957	1,203	1967	--	1977	Hauled	1987	89		
		1958	2,212	1968	--	1978	925	1988	572		
		1959	1,580	1969	--	1979	NA	1989	561		

Source: DFG, IFD, Red Bluff

TABLE 4-2
Fall-Run Chinook Salmon Counts on Mill Creek from 1952 through 1994

Year	Fall Chinook	Year	Fall Chinook	Year	Fall Chinook	Year	Fall Chinook	Year	Fall Chinook
--	16,000	1960	940	1970	690	1980	320	1990	fire fish
--	10,000	1961	1,689	1971	980	1981	1,020	1991	37 car:49 redd
1952	7,000	1962	4,384	1972	631	1982	1,290	1992	395
1953	3,000	1963	1,286	1973	420	1983	200	1993	2,093
1954	896	1964	450	1974	944	1984	5,800	1994	>1,034
1955	5,316	1965	150	1975	1,208	1985	4,180	1995	--
1956	4,340	1966	500	1976	245	1986	574		
1957	837	1967	500	1977	456	1987	282		
1958	940	1968	750	1978	300	1988	1,487		
1959	1,689	1969	1,700	1979	810	1989	1,564		

fall-run chinook salmon have life history strategies that compliment the flow and temperature cycles in Mill Creek.

The winter-run chinook salmon, which is listed as endangered under the federal Endangered Species Act (ESA), is severely declining. The Pacific Fishery Management Council acted in April 1996 to increase the minimum size limit from 26 inches to 27 inches in the commercial ocean fishery and to increase the minimum size limit from 24 inches to 26 inches in the recreational fishery. Both increases start July 2. This action is calculated to increase winter-run spawning escapement by 50 percent. It is based on the concept of providing additional protection to 2-year-old winter-run salmon. This measure should also benefit spring-run chinook. Technical calculation to quantify the benefits for spring-run salmon has not been done.

4.1.D Winter-Run Steelhead

Less is known regarding the winter-run steelhead that spawn in Mill Creek. Information regarding the life cycle of the winter-run steelhead is scarce. The steelhead is a distinctive species because it does not die after spawning and has the potential to return to the ocean for another round trip and possibly spawn more than once. The range of spawning habitat in Mill Creek is primarily in the middle reaches. Observations of steelhead in the upper reaches has not been verified. Many project recommendations apply to the steelhead—the most significant is to improve fish habitat and passage. CDFG published a Steelhead Management Plan in February 1996, and the NMFS published a federal notice regarding proposed rules for steelhead management.

Adult steelhead migration into Mill Creek occurs from early October through June. According to historical records of cumulative percentage of steelhead passing Clough Diversion during a 10-year time span (1953 to 1963), there are two peaks of adult steelhead migration to Mill Creek. The largest peak occurs from the last week in October and the first 2 weeks in November, and accounts for approximately 30 percent of the run. A smaller peak occurs the first 2 weeks in February and accounts for approximately 11 percent of the run.

As indicated in Table 4-3, historical counts were made between 1953 and 1979 and ranged from an estimated 2,256 to 280. For these years of record, the average estimated run size is 1,087 steelhead. CDFG has no records showing adult steelhead holding and spawning distribution within the Mill Creek Watershed. The CDFG started monitoring outmigration of salmon and steelhead juveniles in December 1995 and continued monitoring through fall 1996.

4.2 Status of the Sacramento River

The mainstem Sacramento River is used by salmon and steelhead in their migration routes. The health and condition of the Sacramento River have the potential to impact the anadromous fish populations. Currently there are concerns regarding toxics, temperature and lack of riparian vegetation. The Sacramento River Preservation Trust is a nonprofit conservation group that sponsors a State of the Sacramento River Conference to promote resolution of adverse factors that impact the Sacramento River.

TABLE 4-3
Steelhead Counts at Mill Creek from 1953 through 1979

Year	Mill Creek	Year	Mill Creek
1953	715[a]	1966	
1954	1,492	1967	
1955	1,213	1968	
1956	1,443	1969	
1957	1,301	1970	
1958	790	1971	
1959	417	1972	280[b]
1959	742	1973	
1960	1,222	1974	
1961	2,269	1975	
1962	1,158	1976	
1963		1977	
1964		1978	
1965		1979	

Mean count 1,087
Years of Record 12

[a] Van Woert unpublished

[b] U.S. Fish and Wildlife Service unpublished

4.3 Status of the Delta

The original Delta was an immense wetland which is thought to provide rearing habitat to salmoids prior to entering the ocean environment. Its water was brackish in some years, largely fresh in others. From the perspective of juvenile salmon, a superb place to live for a few months. The salmon could grow rapidly before moving out to sea, where they would face a gauntlet of fast-swimming ocean predators. In the open ocean, the bigger a young salmon is, the better chance it has of returning to reproduce. Rapid growth in the Delta would be accomplished by taking advantage of the productive "edge" habitat with its abundant invertebrate food supply and dense cover to provide protection from predators. This habitat was greatly diminished when the Delta was diked and drained in the nineteenth century, becoming a collection of islands surrounded by channels. However, the net flow of water was downstream, through the system, and there was still lots of edge habitat available, although presumably such habitat was less productive and less protective than formerly. With the advent of the Central Valley Project and the State Water Project, even the hydraulics of the Delta changed, and juvenile salmon were increasingly entrained in diversions or moved into areas from which they could not escape predators (such as the non-native striped bass) or lethal conditions, such as high temperatures. Therefore, the Delta changed from being a desirable place for small salmon to being a place they must move through as rapidly as possible if they are to survive.

Spring-run chinook may have been particularly dependent on Delta conditions, although our knowledge of their life history requirements is remarkably slim. Following is a description of a likely scenario. After spending up to 18 months rearing in the streams in which they were spawned, the juvenile fish moved out with the first high flows in November or January, and then gradually moved into the Delta. There they lived and grew until they could be carried to sea by the annual snow-melt. Presumably, few would be left in the Delta by mid-May. There is some indication (e.g., size distributions of smolts found in the Delta) that this pattern is still important, although it is probable that juvenile fish that remain upstream of the Delta, in the Sacramento River, have higher survival and restoration of salmoid population rates than those that try to rear in the Delta itself.

It is quite clear that if the Delta is to be rehabilitated to a desirable place for juvenile salmon, the amount of shallow water habitat has to be increased and the hydraulics have to be changed to allow the smolts to find their way to sea. Actions being implemented or investigated to achieve these objectives include operating the state and federal pumping stations and the Delta Cross Channel in a more fish-friendly manner, reducing the loss of outmigrants down Georgiana Slough, screening diversions, and increasing shallow water habitat. How well such measures will improve the survival of spring-run chinook salmon is not known. However, because they are basically a means to tinker with the present system of Delta operations, major improvement in survival and restoration of salmonid populations is problematic.

4.4 Commercial and Sport Fishing Industry

The ocean salmon fishery is managed by the Secretary of Commerce acting through the NMFS on rulemaking advice from the Pacific Fishery Management Council (PFMC).

Authority to regulate fisheries in the exclusive economic zone of the ocean from 3 to 200 miles offshore of the United States is promulgated under the Magnuson Fishery

Conservation and Management Act of 1976. This act created the regional fishery management councils and authorized them to develop and implement fishery management plans. The PFMC manages salmon under a framework plan that allows it to modify ocean fishing regulations on an annual basis. Both the commercial and recreational fisheries in the ocean are managed by the PFMC. Under California Fish and Game Code Section 7652, salmon fishing regulations in state waters from 0 to 3 miles offshore are conformed to the federal regulations adopted by the NMFS. In 1996, the Fish and Game Commission adopted new rules regarding the size of fish that may be taken to provide additional protection to winter-run salmon. A more detailed description of ocean fisheries is provided in Appendix K.

4.5 Data Gaps

1. Seek permanent secured funding for "real time monitoring" for anadromous fish for full life cycle within Mill Creek including spawning and outmigrants.
2. Seek changes in the CALFED agreement to ensure adequate flows in Nov - Jan for outmigrants, screening of all delta diversions, and increases in shallow water habitat.
3. Support studies of ocean population to determine additional information regarding life cycle.
4. Support efforts of SRTP to promote the ecological health of the Sacramento River.
5. Study harvest of fall-run chinook salmon to determine impacts to spring-run chinook salmon.
6. Study the correlation between ocean take versus returning fish.
7. Investigate the less invasive methods to tag fish.
8. Support additional evaluations of all factors external to Mill Creek which impact the anadromous fish within Mill Creek.

SECTION 5.0

Existing Resource Protection Measures

The WAC also created a comprehensive list of existing resource protection measures. Compiling the inventory was an important step to creating a clear picture of the areas that have sufficient protection and of those that require additional resource protection measures. This section is organized by the groups that are responsible for resource protection and describes key projects that benefit the ecological health of the Mill Creek Watershed. The resource overlay map (Figure D-9, Appendix D) graphically depicts the location and extent of the protection measures.

5.1 Landowners Efforts

5.1.A Mill Creek Conservancy and MOU Partnerships

The Mill Creek Conservancy was formed by landowners who were interested in promoting resource protection through cooperative efforts. An initial accomplishment was to create a Memorandum of Understanding (MOU) with 17 partners for the purpose of developing a Watershed Management Strategy that could accommodate the varied interests. The Scoping Study process and the preparation of this report are products of that agreement.

In addition to the Watershed Management Strategy Report, the Conservancy members have worked on numerous other projects in the past few years. Major projects included the review of the Wild and Scenic Rivers Suitability Study negotiating the functional equivalent agreement, the adoption of AB1413, acquisition/transfer of PG&E lands with Conservation Easements, and participation in the Endangered Species Act (ESA) hearings for spring-run chinook salmon.

Newsletters are used to keep the membership informed of events and activities that may impact Mill Creek. Annual membership meetings are held and guest speakers attend some of the Board of Directors meetings. Mill Creek Conservancy members have been invited to numerous speaking engagements including the California Bio Diversity Council, Pacific Coast Federation of Fisherman, Water Education Foundation, and University of California Ag Extension Class for Educators to describe resource protection programs. The resource protection efforts will continue through the implementation plan that is described in Section 6.

5.1.B AB 1413 Deer and Mill Creek Protection Act

One of the most significant resource protection measures undertaken by the Mill Creek Conservancy to date was the creation and adoption of the Deer and Mill Creek Protection Act (AB 1413). The state law provides protection against the construction of new dams and/or diversions on private lands of Mill Creek. AB1413 reinforces the Lassen Land and Resource Plan, which contains policies that prohibit new dams and diversions on USFS lands.

Support for the state law was developed when the Deer Creek Watershed Conservancy, Mill Creek Conservancy, and conservation groups, lead by Friends of the River, sought a "functional equivalent" protection for Mill Creek that did not involve a wild and scenic designation. "Functional equivalent" sought to provide all the benefits without the potential impacts associated with increased intensity of use that may have occurred under the wild and scenic designation. All parties were involved in crafting the language and worked together to developed strong and diverse sponsorship for the bill. The bill achieved nearly unanimous support of the State Legislature and was signed by Governor Wilson in the summer of 1995. A copy of the bill is provided in Appendix L.

5.1.C Conservation Easements

Conservation easements can be effective as a voluntary means of protecting resource values on private land. The Conservation Easement is designed to provide the greatest conservation benefits, while allowing the landowner specific retained rights and uses that are compatible with the conservation purposes of the easement. The land stays in private ownership and management, subject to the restrictions of the easement. The landowner may continue to live on the land, sell it or pass it to his or her heirs, and future owners will still be bound by the terms of the Conservation Easement.

A Conservation Easement is site specific. It may affect all or a portion of a landowner's property, and it is specific as to the restricted uses and allowed uses on that property. A Conservation Easement is a legal agreement that places permanent limitations on the use of property. A Conservation Easement, however, does not stand alone. The agreement is made when a landowner conveys an easement to a qualified nonprofit organization, such as the Mill Creek Conservancy. The easement holder then becomes responsible for enforcement of the terms of the easement in perpetuity. This may require annual monitoring of the property and maintaining an ongoing relationship with current and future landowners. In some cases, it may require the easement holder to legally defend the property from uses inconsistent with the Conservation Easement.

Conservation Easements can also offer financial benefits to a landowner. A gift of a Conservation Easement may qualify as a tax-deductible donation. If the easement meets federal tax code requirements, this can mean a savings in federal income taxes.

Equally significant is the potential for reducing estate taxes. By restricting the property's development potential, the easement lowers the market value of the property and thus the tax burden to the landowner's heirs. This can be especially important for owners of highly appreciated property who wish to pass the land on to their children or grandchildren.

There is a Conservation Easement on private property in the upper watershed area over approximately 3 miles of stream corridor. The landowner and The Nature Conservancy have both received benefits from the easement. The landowner requested a document to ensure permanent protection from various types of land uses in the future and thereby qualified as a gift for a tax deduction because of the limited value given the reduced level of land use. The Nature Conservancy is the easement holder and has the right to review the condition of the property to ensure that all provisions of the easement are in compliance. The Mill Creek Conservancy is in the process of researching and pursuing Conservation Easements on private property throughout the Mill Creek Watershed.

The Mill Creek Conservancy is in the process of pursuing a range of long-term resource protection measures including, but not limited to, conservation easements for private property. Mill Creek Conservancy will be researching different types of tools to secure long-term protections including development of boiler plate agreement language that can be tailored to fit specific property owners resource concerns. Different types of legal instruments have been successful in securing resources protection for Mill Creek including conservation easements and tenant in common agreements which specify nondevelopment areas on private property. Each type of agreement/instrument has different level of protection and monitoring/enforcement implications.

5.1.D Wetlands Reserve Program

In addition to Conservation Easements, there is the Wetlands Reserve Program (WRP) that is administered by the U. S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS).

The WRP program is authorized by the 'Farm Bill' and is intended to help preserve wetland for wildlife and other resource benefits. Each year Congress allocates funds to USDA and sets target acreage to be enrolled. The NRCS administers the WRP program and offers sign-ups on a yearly basis.

The WRP is a voluntary program offering landowners a chance to receive payments for restoring and protecting wetlands on agricultural lands. Landowners who have property determined to be eligible for the program are offered a cash percentage of the appraised agricultural value of their property in exchange for an easement declaration. The payment value varies from 75 to 100 percent depending on the length of the easement contract. Depending on priorities established by Congress and USDA, the length of the easement can be 30 years to a perpetuity. A Conservation Easement is a legal agreement between the landowner and USDA to restore and protect wetlands. It is a means by which the landowner voluntarily set limitations on the future use of the land, and yet maintaining the land in private ownership. The NRCS and other agencies assist the landowner in developing a restoration plan and use restrictions for the easement. Depending on site conditions, WRP plans may include hunting, fishing, timber harvest, and haying or grazing. Duration and timing of these activities are detailed in the plan which is approved by NRCS and the local Conservation District with review by other agencies.

Conservation Easements like the WRP offered by USDA can be used to help protect resources in the Mill Creek Watershed, while preserving private property rights.

5.1.E Pasture Restoration and Rotation

Conservation minded landowners in the upper Mill Creek Watershed elected 4 years ago to "rest" their pasture land along Mill Creek. This was done as an experiment to view the effects of "no grazing." The "resting/restoration" measure also allowed time to evaluate the vegetation condition without grazing or artificial irrigation. The most significant changes within the 4-year period have been along the stream banks where, today, willow and alder trees have made a resurgence. Each year the size and number of willows and alders has increased.

It can be argued that livestock grazing improves the pasture; however, no information is available regarding the historic condition of this area prior to the 1850s. However, it should

be kept in mind that the present conditions along the creek have evolved since that time under the present grazing management regime. Today, enlightened use may result in the study of historic conditions and our ability to use an ecosystem approach to consider all factors including the amount and type of use that can be sustained without undue threat or harm to the natural environment.

5.1.F Timber/Biomass Reduction, Prescribed Burns on Private Land

Programs that will be implemented by SPI within the Mill Creek Watershed include timber harvest plans. The timber harvest plans include clearcuts, shelterwood removal harvests, commercial thinning, sanitation-salvage, and selective harvests. The various silvicultural treatments coincide with the variety of habitat types that have developed as a result of fire, fire suppression, and past forest management activities. SPI's objectives are to improve timber production on a sustainable yield, provide a defensible fuel protection zone against wildfires, control forest diseases and pests, and provide a mosaic of habitat types to accommodate the various species of wildlife present in the Mill Creek Watershed.

These programs will be implemented over the next 10 years. Harvesting will be done by tractor yarding, cable yarding, mechanized harvesting, and helicopter logging. Tractor yarding and mechanized harvesting will be done on slopes less than 30 percent in gradient. Cable yarding and helicopter logging will be done on the steeper slopes and in areas where road construction is not feasible.

Portions of the harvest units will be treated by prescribed fires of the understory vegetation and fuels which have accumulated as the result of harvest activity. This will help to reduce the threat of a catastrophic fire in the upper portions of the Mill Creek Watershed and achieve the objectives previously mentioned.

The primary management objective of Collins Pine is to ensure a sustainable and predictable supply of high quality timber products for local processing facilities while maintaining a healthy forest ecosystem. In 1993, the CAF became one of the first in the United States to achieve forest management certification based on the elements of Timber Resource Sustainability, Forest Ecosystem Maintenance, and Socio-Economic Benefits. Subsequent evaluations have confirmed and even emphasized Collins Pine's outstanding performance in these categories.

One of the negative impacts associated with a relatively conservative silvicultural method is that the overstory canopy is not sufficiently open enough to encourage adequate pine regeneration. In addition, fire has been excluded from the forest for the last 75 years. This combination has allowed the shade tolerant species such as white fir to thrive in the understory and virtually preclude the pine species from the younger age classes. Inventory plots show that ponderosa and sugar pine constitute 47 percent of the standing mature volume in the Mill Creek Watershed, while white fir accounts for only 41 percent. However, white fir makes up nearly 90 percent of the understory in these stands. This has produced an unnatural and unhealthy forest. Biomass harvesting and small log thinnings are effective management tools that can be used to help correct this problem. Collins Pine has been using biomass harvesting in this watershed for the past 3 years and small log thinning was started in 1996. The objectives of these harvesting techniques include:

- Manage for maximum sustained yield of forest products while maintaining biodiversity by removing many of the surplus small fir trees.

- Improve forest health by retaining trees that exhibit superior growth and returning forest to natural carrying capacity.
- Decrease fire danger by removing small dead trees and breaking the vertical fuel ladder.
- Increase groundwater availability by reducing the transpiration rate and providing more areas for snow accumulation and snow-melt penetration.
- Improve wildlife habitat by encouraging small mammal prey base.

While biomass and thinning operations effectively mimic the physical and structural properties of historic, light intensity fires, they do not include the biochemical and physiological elements that nature provides in true burns. These are important environmental characteristics that are necessary for ensuring pine regeneration, maintaining defensible fuel breaks, and providing sustained forest health. Once mechanical harvesting has reduced the fuel loading in the stand to a manageable quantity, light underburning can be reintroduced. Over the past year, Collins Pine foresters have worked with local California Department of Forestry and Fire Protection personnel to develop a strategy to implement a burn program in previously thinned areas. Some underburning has been done on a small scale, and valuable lessons have been learned. This research and implementation tool is planned to be used on a larger scale in the next few years.

5.1.G Agricultural Preserves and Timber Preservation Zone Programs

Two state programs, the Agricultural Preserves and the Timber Preservation Zone, have been implemented by Tehama County. These programs provide resource protection for lands within Mill Creek Watershed. Both programs apply to private lands and are voluntary. The landowner can elect to enter into a contract with the county to limit the use of the property to agricultural or timber production, reducing the development potential. The contractual agreement to limit the use of the property is generally for a 10-year period, which qualifies the landowner for a reduced tax rate. These programs were designed to promote long-term agricultural, open space, and forestry harvesting.

5.2 United States Forest Service

5.2.A Lassen Land and Resource Management Plan (LRMP)

5.2.A.1 Lassen National Forest—Almanor District

The Mill Creek Watershed is within the Almanor District of the Lassen National Forest. The District Ranger uses the LRMP to make decisions regarding the management of the forest lands. All land and resource management activities and all budget proposals are based on the LRMP.

The LRMP directs the management of the Lassen National Forest. It does not apply to any state, private, or other federal land within the forest boundaries. The purpose of the LRMP is to guide the integrated protection and use of the forest's resources, meet requirements of legislation, and address local, regional, and national issues. To accomplish this, the LRMP does the following:

- Sets the Lassen National Forest goals and objectives for the next 10 to 15 years (planning period)
- Sets the standards and guidelines, and the approximate timing and location of practices necessary to achieve these goals and objectives
- Sets the requirements for monitoring and evaluation needed to ensure that management direction is implemented and its objectives are met

Provisions of the National Environmental Policy Act (NEPA) required analysis of the USFS LRMP environmental impacts. An Environmental Impact Statement (EIS) was prepared in conjunction with the LRMP and describes the management alternatives considered for the Lassen National Forest and the environmental effects of each alternative. The preferred alternative was identified and developed into the LRMP, which was adopted in 1993. The LRMP and the EIS are considered as a whole, rather than separate documents.

The LRMP hierarchy of management direction consists of three integrated components:

- Forest (wide direction)
- Management Prescriptions
- Management Area Direction (specific area)

Forest (wide direction) applies to the entire Lassen National Forest and expresses the intent of laws and regulations. Management Prescriptions identify the resource or use activities to be emphasized on particular types of land. Management Area Direction gives additional policy unique to specific areas of the forest. The three USFS Management Areas within the Mill Creek Watershed include Upper Mill Creek, Lower Mill Creek, and Ishi Wilderness.

The three Mill Creek Watershed Management Areas constitute approximately 69,805 acres. A total of 55,410 acres of the area is devoted to Wilderness Areas and Special Areas that constitutes 79 percent of the USFS lands. These areas are protected from logging and other activities that could compromise the natural and cultural resources. In addition, there are 4,600 acres that are designated Late Successional forest. These areas may receive additional protection under the California Spotted Owl (CASPO) and SNEP programs. In that case, a total of 86 percent of the USFS lands would have significant resource protections.

Concerns have been raised about an Upper Mill Creek Management Area Facilities Guideline to analyze opening the old road to Big Bend and provide a trailhead and access trail to Mill Creek from the end of the road. There could be conflicts from additional road construction within the Mill Creek Roadless area that could impact critical habitat, old growth forest, and cultural resources. Prior to pursuing implementation of that policy, a complete environmental review would be required and a recommendation made that the Mill Creek Conservancy review the policy with the USFS.

Since 1993, the LRMP has been revised twice by administrative amendments and once by legislation. These revisions include the following:

- The 1992 CASPO guidelines which prohibit logging in spotted owl habitat and protects all trees greater than 30-inch DBH pending completion of permanent direction to protect spotted owl habitat. Permanent spotted owl direction intended to replace existing CASPO guidelines is proposed in the California Owl EIS, which was reissued as a supplemental draft document for public review in fall 1996.

- The 1995 PACFISH interim strategies which are intended to protect at risk anadromous fish stocks by identifying key watersheds, restricting logging and road building in riparian reserves, and initiating a watershed analysis process intended to produce permanent strategies. The PACFISH interim strategies have been extended through 1997. The USFS is still preparing the Mill Creek Watershed analysis and has yet to propose long-term strategies.
- Congressional approval of the 1995 budget Rescission Bill which included an amendment that exempts "emergency salvage" logging from compliance with most environmental laws and all LRMP non-wilderness standards and guidelines that constrain logging activities. The salvage amendment expires in December 1996.

According to the USFS, there are no immediate plans for scheduled commercial logging or "emergency salvage" logging under the rescission amendment on public lands in the Mill Creek Watershed. The agency intends to complete the Mill Creek Watershed analysis by early 1997, at which time long-term strategies may be proposed that could affect future management. Meanwhile, the USFS continues to operate under PACFISH direction in the watershed which provides protection for salmon and steelhead populations.

The overall management scenario displayed by the LRMP and its subsequent administrative amendments indicates a clear direction towards watershed protection, particularly for anadromous fish habitat, old growth forests, and roadless areas. However, interim PACFISH direction has been allowed to expire and similar direction for spotted owl/old growth forest habitat is subject to possible major revision in the near future by the Cal Owl EIS. In addition, existing forest plan management can be amended by a Congress.

Key resource protection measures used by the USFS that have beneficial impacts for the Mill Creek Watershed include road erosion control, riparian fencing, and revegetation projects. In addition, the PACFISH and the CASPO programs are intended as additional resource protection measures for Mill Creek Watershed.

Future issues and trends for management of public land in the Mill Creek Watershed include:

- Continued movement toward an ecosystem approach to the management of public lands. This includes assessment of existing and desired conditions in developing vegetation management prescriptions. For instance, managing stands to achieve a desired habitat characteristic and fire risk, rather than a timber volume objective.
- Greater emphasis on monitoring of activities and conditions to provide information necessary to adapt management strategies and prescriptions. Collecting monitoring data by efficient and effective means.
- Increased coordination with private landowners and agencies to accomplish watershed and other larger scale management objectives.

5.2.B Riparian Fencing

Riparian fencing is being used as a tool to manage impacts from livestock on riparian areas. This technique has be used on upper Mill Creek; however, riparian fencing is not the only

key to reducing impacts to riparian vegetation. Livestock management, restoration, and rotation practices are tools that are designed for site-specific situations have been successful.

The USFS constructed riparian fencing along Mill Creek in the upper watershed in 1986. The fencing completely fenced off three pastures, and in 1986 reduced livestock use along Mill Creek on USFS land. Without a significant runoff event in the past 10 years, the reduced livestock grazing in this particular area has allowed willows, alders, and cottonwoods to encroach on the flood plain and stabilize the gravel bars in this area.

Additional consideration for future riparian fencing projects include:

- Utilization of rotational grazing practices to benefit riparian areas. The beneficial effects derived would include riparian stubble height that is present after grazing that actually increases the deposition of sediments along the streambank. Tall grasses that lay down actually lead to less sediment deposition. A recent scientific article published in Rangelands, (a professional publication of the Society of Range Management), August 1996, written by W.P. Clary, et al., entitled, *Riparian Stubble Height and Recovery of Degraded Streambanks*. Discusses the relationship between stubble height and sediment deposition and retention along streambanks. The study indicated that most sediment deposition occurred, surprisingly, at 0.5 inch up to 6 inches of stubble height. Taller vegetation tended to bend in the flow in the downstream direction, protecting and retaining sediments. The deposition and retention of sediments is simply one benefit to streamside riparian areas that a well managed grazing program can provide.
- The use of exclusionary fencing needs to be site specific. In other words, if you have a specific area that cattle are adversely effecting, exclusionary fencing can be used to effectively treat that problem.
- Exclusionary fencing needs to be constructed out of material that is durable enough to last many seasons and be functional to _____ the existing parameters of the specific range.

The cattle industry has been concerned that the general public does not comprehend the proper range management techniques and the associated reduction in impacts. In addition, there is a concern that the amount of public land for grazing may be reduced, therefore reducing the amount of animal units in a given area which could jeopardize the economics of an operation/industry. Long-term range management and good environmental practices are necessary to gain acceptance by the non-ranching public.

5.2.C Revegetation/Restoration of Riparian Zone

The goal of planting native species in degraded riparian zones is to recover ecological values lost with the loss of native streamside plant communities. These ecological values include shaded aquatic habitat, terrestrial wildlife habitat, wildlife migration corridors, and stable stream banks. Some aquatic species require shaded aquatic habitat created by the canopies of streamside trees and shrubs, which maintain cool water temperatures. Terrestrial species, such as bobcat, deer, and mink inhabit riparian vegetation. Other wildlife, including neotropical birds, use riparian zones in Mill Creek Watershed both as habitat and migratory corridors. Native vegetation maintains the natural stability of banks and therefore prevents accelerated rates of erosion and sedimentation, which can damage streambeds and degrade aquatic habitat important for the fisheries.

In 1980, the USFS started a project to stabilize a seriously degraded ephemeral drainage and to revegetate 20 acres of bare ground. In 1984, there were efforts to improve fisheries habitat in the Mill Creek by using boulder clusters to create pools for resting cover and planning riparian vegetation in areas of unstable stream banks. The winter of 1984-1985 caused some serious erosion problems and approximately 3 to 5 acres of meadow were lost. In 1986, a project was undertaken moving logs that were diverting water into the eroded streambanks and placing them in such a way as to divert water under high flow conditions away from these problem areas.

5.2.D PACFISH Watershed Analysis

In 1994, the USFS and the BLM provided the public an environmental assessment of interim management strategies to address the decline of anadromous fish in watersheds outside the range of the northern spotted owl. The document was circulated and there was opportunity for public comment. The purpose of the interim guidelines was to prevent any further endangerment to at-risk anadromous fish stocks while preparing the watershed inventories. The PACFISH interim guidelines were adopted by the USFS in 1995 by the amendment procedure, which is described in detail in Appendix A3. Part of the PACFISH program involves the preparation of a watershed inventory. The analysis of the information that is developed in the watershed inventory will be used for the long-term management strategies to arrest the degradation and begin the restoration of aquatic habitat and riparian areas on USFS lands.

Interim management guidelines for PACFISH will be replaced by the long-term management strategy upon the completion of the watershed analysis. Agreement to extend the interim strategy has been reached by the USFS and BLM. A Biological Opinion regarding the ecological soundness of the long-term strategy has been solicited from NMFS.

The USFS evaluates ongoing and proposed activities within the watershed for compliance with PACFISH Standards and Guidelines. The intensity of this analysis varied depending on the amount of available information. Conditions in intermittent and tributary streams within grazing allotments, and observations of developed recreation use on harassment of salmon and disturbance of habitat during holding and spawning were reviewed by the USFS during summer 1996.

The USFS prepared a monitoring plan to assess conditions as they relate to PACFISH Resource Management Objectives and other parameters relevant to the Mill Creek system. Data collection for this effort has started and will be shared when available. Monitoring locations include three sites on the Mill Creek main stem (Brokenshire, Hole In the Ground, and Black Rock).

The Mill Creek Watershed analysis has been started by the USFS. The analysis includes collecting and analyzing historic data and existing data to address the following seven core questions:

- **Stream Channels and Riparian Conditions.** USFS staff are comparing data from various surveys to assess changes in conditions over time. This includes stream temperature data from the 1940s, 1960s, and 1990s, and assessment of alluvial channel conditions from aerial photography interpretation from the 1940s through the 1990s. Aerial photography is also being used to assess disturbance in the near stream areas over the same time periods. "Hard" stream habitat data are limited, but USFS staff are comparing

some key habitat elements (pool depth) from surveys conducted in 1981-82, 1987, and USFS surveys completed in 1991 and 1992.

- **Erosion Processes.** USFS staff are developing rough sediment production data for the same time periods as listed above. Data are integrated from soil surveys, slope, and watershed disturbance data. Disturbance data have been developed by record search and aerial photography. USFS is also assessing mass wasting throughout the aerial photography photo period. Data from the channel disturbance analysis will be combined with the surface and mass wasting components to produce an estimate of total yield. Data on road-related erosion will be derived from the USFS's 1993 survey, and from the survey currently being conducted by Meadowbrook Conservation Associates.

- **Fish and Other Aquatic Organisms.** In addition to the habitat evaluations discussed above, USFS is compiling and evaluating fishery survey data from CDFG, USFS, and other records. This includes both anadromous and other species. USFS staff will compare trends in these data with the watershed, habitat, water yield, and Sacramento systemwide fishery abundance data.

- **Water.** Existing flow data are being compiled. Gauges with short periods of record will be correlated with the long-term sites. This may provide a better picture of upper watershed flows. Flow data will be useful in comparing temperature data between years. Peak flow events will be examined for correlation with changes in habitat and stream channel data.

- **Human Uses.** USFS is searching records and publications to present a chronology of human settlement and use of the watershed. This includes pre-historic use.

- **Fire/Vegetation.** USFS collected data on both fire history and vegetation. Ecology Plot data (from areas with little management disturbance) will be compared to Forest Inventory Assessment (FIA) plot data to make interpretations on historic and existing condition. These data have been collected and the interpretation should be complete by mid-August. In addition, the USFS cooperated with Penn State University to collect information on fire history within the watershed. Slabs were collected from stumps and live trees within the Ecology and FIA plots. They will be scanned to detect fire occurrence. These data will not be analyzed until this fall. The USFS is also working with the USFS's National Remote Sensing Center to develop fire risk maps. This involves use of forest timber type maps (developed for the forest LRMP) to cross walk to fuel types. Historic fuels inventories will be used to assist in this approximation. Finally, satellite imagery will be used over different time scales (1982 to the present) to detect changes in vegetation (and fuel types).

- **Restoration.** Assessments of restoration needs are a part of the watershed analysis. Restoration will be a high priority following the analysis.

USFS will summarize all the above mentioned data and share that information with the Mill Creek Conservancy and WAC as soon as it is available. The Mill Creek Conservancy, WAC, landowners, and experts will be invited to provide input regarding the review of the Watershed Analysis and the synthesis of findings. The USFS will seek to determine the connections between the various resources and land use history. In addition, they will be able to identify critical information gaps.

5.2.E California Spotted Owl Sierran Province Interim Guidelines Environmental Assessment Status

Current management of spotted owls in the Mill Creek Watershed follows direction established in the California Spotted Owl Sierran Province Interim Guidelines Environmental Assessment (CASPO EA) which was released in 1993. The Owl EIS has been delayed because of an extended comment period relating to the release of the Sierra Nevada Ecosystem Project (SNEP) report, which is discussed in Section 5.5.H. Until the EIS is finalized, the USFS will continue to follow direction from the CASPO EA.

A demographic study of California spotted owls in the Lassen National Forest is currently underway. This is a long-term study conducted by the Pacific Southwest Research Station. Specific information regarding owls in the Mill Creek area may be contained in that report.

5.3 California Department of Fish and Game

The CDFG is an active partner in the protection of natural resources within the watershed. CDFG's personnel have worked hard in many areas to ensure resource protection. Their efforts include the overall management of fish and game issues and programs for California, the Water Exchange Program, Ward Diversion Improvements, Streamwatcher Program, No Take Provision, and review of permits. All of these important measures are discussed in detail below.

The CDFG has made a significant contribution to Scoping Study process and this report. CDFG staff have provided support for field trips, stewardship fair, guest speakers, written material, and comments for this report.

The majority of habitat within the Mill Creek Watershed is undisturbed and consequently the immediate need for fishery habitat improvement projects is limited. The state Salmon, Steelhead Trout, and Anadromous Fisheries Program Act of 1988, included sections that set the general goal of increasing the natural production of anadromous fish in Central Valley rivers and streams on a sustainable long-term basis. The act provided funding for the *Restoring Central Valley Streams: A Plan for Action*, which provide detailed lists of specific restoration actions. A follow up report, *Status of Actions to Restore Central Valley Spring-Run Chinook Salmon*, prepared by the CDFG, lists additional fishery restoration actions specifically directed at spring-run chinook salmon.

- Within the Mill Creek Watershed, the various CDFG plans identified several physical and administrative fishery restoration actions:

  - Provide adequate instream flow
  - Rectify adult passage at Clough Diversion
  - Renovate spawning gravels in lower Mill Creek
  - Renovate apron at Ward Diversion (completed August 1996)
  - Maintain and restore riparian habitat along lower Mill Creek
  - Install stage recorders to monitor flows
  - Implement land use policies that provide long-term watershed protection

5.3.A Water Exchange Program

5.3.A.1 Mill Creek Water Exchange Agreement

The Mill Creek Water Exchange Agreement (Agreement) specifies the use of pumped groundwater for irrigation purposes in exchange for in-stream water rights to augment transport flows for adult spring-run chinook salmon between the mouth of the Sacramento River and the Ward Diversion.

In dry years, during the two critical salmon migration periods of May through June (for spring-run) and October (for fall-run), water right holders on the valley floor may divert nearly the entire flow of Mill Creek. As a result, upstream migration of adult spring-run chinook and downstream migration of juvenile salmon and steelhead can be impeded or entirely blocked. Supplemental flows provided through a unique water exchange program are helping to restore this population by allowing migrating adults to reach their holding and spawning habitats, and by providing transportation flows for juveniles en route to the Sacramento River.

Funded by the CDFG and the State Water Contractors DWR, upon the recommendation of the Delta Pumps Fish Protection Agreement Committee, a Three-Party Agreement was completed between CDFG, DWR, and the LMMWC, for Phase 1 of the Mill Creek Water Exchange Program. Phase 1 included construction of a new well and restoration of an existing well, both located on The Nature Conservancy's Dye Creek Preserve. Under the Agreement, groundwater is used to supply a portion of LMMWC's water requirement in exchange for leaving an equivalent amount of water in Mill Creek during critical migration periods. The Agreement provides the framework through which fish passage is facilitated on Mill Creek and a mechanism for water banking. The water banking provision allows flows bypassed to the creek during critical migration periods to be repaid over several irrigation seasons.

Trial Mill Creek flow exchanges were conducted in cooperation with CDFG Region I, CDFG Inland Fisheries Division personnel, and LMMWC in May and June 1990. During a 36-hour exchange flow period an estimated 200 salmon passed through the electronic fish counter at Clough Diversion, compared to the passage of three adult salmon during the previous 3 days. The number of adults migrating to upstream holding areas was encouraging, and established that adequate transportation flows are essential to the restoration of the spring-run salmon population in Mill Creek. Although the Phase 1 water exchanges were demonstrably successful in increasing the number of adult fish that passed upstream, water exchanges under Phase 1 were constrained by the capacity of the state's wells (9 cfs).

Phase 2 involves a second Agreement, wherein the LMMWC and a local landowner with priority water rights to Mill Creek forego diversion of an additional 16 cfs from Mill Creek when the water is needed for spring-run salmon migration (or fall-run spawning in dry years). This effectively increases the project's instantaneous capacity of 25 cfs. In exchange, the project pays the landowner's costs to operate an irrigation well and LMMWC uses the undiverted water when it is not required for fishery purposes. In effect, CDFG acquires an on-demand flow of 25 cfs in Mill Creek for salmon transpiration and spawning. Although a flow of 25 cfs appears to be marginally adequate for fish passage, the banking provisions of the Phase 1 Agreement allow for much larger flows, if necessary. Additional study and investigation regarding the analysis of instream flows is necessary. D.W. Alley and

Associates prepared a report regarding lower Mill Creek that needs to be reviewed and the appropriate alternative methods for achieving adequate fish passage evaluated.

5.3.B Fish Passage Improvements/Ward Diversion

The Ward Diversion (the lower diversion) is located approximately 3 miles from the confluence with the Sacramento River. This diversion is operated by LMMWC. As Water Master, LMMWC provides irrigation water to its shareholders and eight other water right holders.

The structure is low profile and increases water surface elevation by approximately 5 feet The creek bed load upstream of the diversion is the same elevation as the diversion crest; therefore, little water is impounded upstream.

The fish ladder on the Ward Diversion is functional and during normal flows provides easy fish passage. However, during high flows fish may have difficulty in locating the inlet to the fish ladder because of turbulence. Prior to 1987, upstream migrants which jumped onto the apron at the base of diversion in an attempt to pass were repelled by the vertical wall and then swept back onto the rocks below. This may have caused injuries that could prove fatal before they could spawn in the fall. During very high flows, the fish ladder is impassable because of extreme water turbulence.

However, in September 1987, LMMWC refaced the apron on the Upper Diversion. The design was changed from a vertical wall with a downstream apron to a vertical wall with a ramp downstream extending below the water surface. This design reduced the downstream turbulence, which provided better attraction to the fish ladder. During high flows, salmon swam over the face of the diversion. In low flows, adult salmon have been observed swimming over the face in as little as 5 inches of water.

LMMWC and CDFG have agreed to change the design at the Ward Diversion to provide improved fish passage. The design change will require that apron below the diversion be extended approximately 15 feet and to change the face of the diversion to a ramp. By extending the apron, the ramp should extend to or below the waters surface. There will be no water falling off the apron reducing the attraction and avoiding salmon jumping at the apron.

In 1996, the Ward Diversion was reconfigured from a vertical walled structure with horizontal sill to a gradual inclined ramp. The downstream edge of the inclined ramp will be below the mean low water pool level to prevent salmon from attempting to jump at the dam. The slope of the ramp type diversion will be slight and will allow fish to swim up and over the diversion when moderate to high flows exist in the stream. The Ward Diversion fish ladder will be rebuilt as a pool and weir type fish ladder with increased water capacity which will allow operation at a higher range of stream flows.

5.3.C Streamwatch, CAL TIP

The Mill Creek Streamwatch program initiated with CDFG in the spring of 1995 has provided the public with the information necessary to report law violations and poaching problems. This effort was preceded by a letter to Judge King of the Tehama County Court, apprising him of the need for special attention to cases concerning the spring-run chinook salmon in Tehama County. The most notable citizen report was by a lady from Red Bluff

who reported the take of a spring-run female salmon from Mill Creek at Hole In the Ground. The apprehension and conviction of the violator resulted in a $733.00 fine.

Currently, Mill Creek Conservancy members post special angler regulation signs provided by CDFG throughout the public areas of the watershed.

The CDFG regulation sign posting program is proceeding well. Posting of larger signs that explain the natural history and plight of the spring-run salmon may encourage the public to become more supportive of the resource protection measures.

Because of the turbidity of Mill Creek and the remoteness/inaccessibility of the adult spring-run holding and spawning areas, the loss from poaching is insignificant in the higher reaches of the stream. This may not be the case in the lower elevation areas, especially from the mouth through the community of Los Molinos to the foothills. An increased effort to involve the homeowners and property owners adjacent to the stream in this lower reach would be beneficial. It is difficult to patrol the urban area where the stream is bounded by homes and fenced yards.

Whenever upstream migrants are delayed by diversions, they are more vulnerable to predation and poaching. Therefore, these locations need special attention. Increased vigilance by concerned citizens who are prepared to report violations is of great importance. Use the toll free phone number (1-800-952-5400) to report any suspicious/poaching activity and contact Mill Creek Conservancy for stream watcher information.

5.3.D No Take Provision

CDFG changed the No Take Provision for trout and salmon in 1994. The most recent sport fishing regulations that apply to Mill Creek were adopted in March 1996 and are effective until February 28, 1998. Following are the current regulations for trout, salmon, and steelhead:

- From the Lassen Volcanic National Park boundary downstream to the U.S. Geological Survey (USGS) gauging station cable crossing at the mouth of Mill Creek Canyon: Open season and special regulations, last Saturday in April through November 15. Only artificial lures and barbless hooks may be used. Daily bag and possession limit is 0.
- From the USGS gauging station cable crossing at the mouth of Mill Creek Canyon downstream to the mouth of Mill Creek: Open season and special regulations, June 16 through September 30. Daily bag and possession limit is 0.

No Mill Creek salmon, trout, or steelhead may be kept by anglers. The restriction on trout was designed to reduce the angler pressure on salmon and steelhead. The CDFG has designated a portion of Upper Deer Creek as an area where trout may be kept. There is also a stocking program for upper Deer Creek to provide additional opportunities for the fishing public, which is nearby to Mill Creek. All anglers are required to know the fishing regulations for the area that they are fishing. Regulations are reviewed and changed by the California Fish and Game Commission.

5.4 Conservation Organizations

Comprehensive resource management requires the talents and skills of different groups and individuals. The assistance that these well established groups have provided the Mill Creek Conservancy has been invaluable.

5.4.A The Nature Conservancy

The Nature Conservancy plays a major role in the Mill Creek Watershed as managers of the Dye Creek Preserve (Preserve). The Preserve is an example of an innovative project that has multiple benefits to different interests and the environment. The Preserve is managed to retain agricultural and recreational uses, in addition to providing opportunities for research educational activities and undisturbed wildlife habitat. The Nature Conservancy uses a 5-year plan to evaluate, plan, and implement projects and programs that are consistent with the overall goals of the Preserve.

The Nature Conservancy also supplies needed support to landowners and conservation groups that are pursuing similar goals. The Mill Creek Watershed is recognized by The Nature Conservancy as a unique area and has received support and resources for specific programs and activities. The Nature Conservancy's Lassen Foothill Project, which includes Mill Creek Watershed, has been identified as a significant undisturbed natural resource area that includes notable species found nowhere else in California.

5.4.B Friends of the River

Friends of the River has played a major role in formulating policies and management directions for the public lands within the Mill Creek Watershed. They have also contributed greatly to the recent local landowner efforts by providing input and ideas regarding long-term resource protection measures and information regarding important legislative matters. Friends of the River was a key partner with Mill Creek Conservancy in the development of the functional equivalent agreement.

5.4.C Sacramento River Preservation Trust

The Sacramento River Preservation Trust has been in existence for more than 10 years and has been the model for local involvement in environmental issues. The Trust has been a force in pursuing protection for the Sacramento River, its tributaries, and the associated creatures that are dependent upon the river. The State of the River Conference, sponsored by the Trust, addresses issues that continue to confront the Sacramento River or the tributaries.

5.4.D Eastside Tributaries—Watershed Groups

Since 1994 several watershed groups that are east tributaries to the Sacramento River have formed or are in the process of forming. The areas involve include Big Chico Creek, Battle Creek, Butte Creek, Deer Creek, and Mill Creek. The level of interest has been extremely high and has had enjoyed support from many sectors. Agencies, universities, local schools, private companies, and irrigation districts have helped these groups by providing input, information, and encouragement. The "local approach" to resource management has begun on the east side tributaries and appears to be providing positive results. The amount of

interest and participation in the Mill Creek Scoping Study sessions has been strong and other groups have also initiated watershed planning activities. Pertinent information for some of the watershed groups is contained in the appendix.

5.4.E Spring-Run Chinook Salmon Work Group

The spring-run chinook salmon work group was founded by a variety of interested individuals including the Pacific Coast Federation of Fishermen's Association and the Sea Grant Extension Program in October 1992. The purpose of the work group was to discuss actions that could be taken to avoid listing the spring-run chinook salmon as an endangered species. Funding for this continuing effort has been provided by Sea Grant, CDFG Salmon Stamp Program, National Fish and Wildlife Foundation, and the U. C. Cooperative Extension.

The group has a diverse membership that holds 10 to 11 meetings a year. During the course of the work group existence, approximately 300 individuals have attended a meeting(s) and receive a monthly newsletter/meeting announcement. At the first meeting of the work group, there was consensus on this general goal: "Restore Sacramento River system native spring-run chinook salmon runs and their habitat."

The group developed an action plan and identified options for restoration action. Early in its planning process, the work group identified watershed planning for habitat protection and restoration in Butte, Mill, and Deer creeks as its highest priority. Meetings in the local area of these watersheds were convened. It was soon realized that locally based watershed conservancies would be the best lead groups to take on the tasks of watershed planning. As the conservancies began to take the lead, the spring-run work group shifted its emphasis to expanding the range of the spring-run salmon into watersheds where it had become scarce or extinct such as Battle and Clear creeks. The work group is now primarily focused on providing technical outreach and informational exchange.

5.4.F Tehama Fly Fishers

Tehama Fly Fishers (TFF) is a nonprofit organization dedicated primarily to the preservation and enhancement of California's salmon, steelhead, and shad populations, particularly those in the Sacramento River system.

TFF was formed in 1977 by a group of Red Bluff, California, sportsmen who enjoyed fly fishing in the Sacramento River and its tributaries, and wanted to do something to help ensure that fish populations would continue at levels where future fishermen would be able to enjoy the same excellent fishing.

TFF is especially focused on the protection and enhancement of streams in Tehama County, California. However, its membership includes recognized fisheries authorities, commercial and sport fishermen, environmentalists, and business people who meet at a weekly forum to analyze proposed legislation affecting California's fisheries in general and seek solutions to current and anticipated future fisheries problems. Originally, TFF activities were centered primarily on the environment and fishing. Efforts expanded to include the conservation issues which are necessary to maintain and enhance the fish resource especially in the political area. A logo was adopted which indicated a major concern for Northern California Waters, "Cleaner Water Brighter Streams."

TFF works cooperatively with the Deer and Mill Creek Watershed conservancies, and major sport and commercial fishing organizations including, Trout Unlimited, United Anglers of California, Sportsmens Council of Northern California, Sacramento River Preservation Trust, Northern California Federation of Fly Fishers, Northern California Fishing Guides, Salmon Unlimited, and California Kamloops, and Steelhead Unlimited. In addition, TFF members hold prominent positions in the Central Valley Fisheries Coalition, and the CDFG's Upper Sacramento River Salmon and Steelhead Advisory Committee.

TFF is a shareholder of the Public Trust resources and understands its responsibilities under the Public Trust Doctrine, with a special concern for the Northern California areas especially Tehama County and its many beautiful streams. TFF was instrumental in Sacramento River winter-run salmon being placed on both the California and federal endangered species lists, having filed the state petition, and supplied data for and supported the federal listing. In addition, TFF successfully petitioned the Tehama County Board of Supervisors to support opening the gates of Red Bluff Diversion Dam on the Sacramento River to improve fish passage, and to also support Mill and Deer Creek watershed groups in their efforts to enhance spring-run salmon in those creeks.

5.5 Other Agencies/Reports

5.5.A U.S. Fish and Wildlife Service/Central Valley Project Improvement Act

The Central Valley Project Improvement Act (CVPIA) directs the Secretary of the Interior to develop and implement "a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991" (Section 3406[b][1]). The Anadromous Fish Restoration Plan (Restoration Plan) is being developed for the program to satisfy this directive. The program is known as the Anadromous Fish Restoration Program (AFRP).

The Restoration Plan describes criteria used to make an initial determination of reasonableness of the restoration actions being considered for inclusion in this plan. These criteria included consideration of potential adverse economic and social impacts, public sentiment, the magnitude of benefits, the certainty that an action will achieve the projected benefits, and the authority established by existing laws and regulations.

The Restoration Plan provides a list of actions considered by the USFWS to be reasonable, and identifies those that are underway or likely to be implemented in 1996. The plan also describes a process to implement actions. Following are four Mill Creek actions and one evaluation:

- **Action 1.** Continue to provide instream flows in the valley reach of Mill Creek to facilitate the passage of adult and juvenile spring-, fall-, and late-fall-run chinook salmon and steelhead.
- **Action 2.** Preserve the habitat productivity of upper Mill Creek through cooperative watershed management.
- **Action 3.** Improve spawning habitats in lower Mill Creek for fall- and late-fall-run chinook salmon.

- **Action 4.** Maintain and restore the riparian habitat along the lower reaches of Mill Creek.

The AFRP relies heavily on local involvement and partnerships with property owners, watershed workgroups (such as the Mill Creek Conservancy), public and private organizations, county and local governments, and state and federal agencies. The AFRP will coordinate restoration efforts with those by other groups, such as CDFG, Category III of the Bay-Delta Agreement, and the CALFED Bay-Delta Program.

5.5.B Tehama County Public Works Department

The mission of the Tehama County Public Works Department is to provide service, support, and technical expertise within the areas of transportation, water resources, roads and bridges, land development, solid waste, and related functions. The Department seeks to advance life, safety, and general welfare in effective, efficient and responsible public works.

The Public Works Department, located in Gerber, houses the Roads and Bridges Division, County Surveyor, Transportation Commission, Flood Control and Water Conservation District, Solid Waste, Mineral Sanitation District, and the Subdivision and Land Development Division. Each of these areas is discussed in more detail below, with the exception of the Flood Control and Water Conservation District, which is reviewed in a separate agency profile.

Roads and Bridges

Mandated and Essential Services. As provided for in the California Streets and Highways Code and the Tehama County Code, this section improves, repairs, and maintains the County road system. There are nearly 1,100 miles of roads in the County-maintained mileage system, as well as 352 bridges. Additionally, this section provides the engineering, encroachment, and right-of-way services needed to maintain the road and bridge system. This budget unit comprises the bulk of the Public Works Department.

Goals and Objectives. More than 20 road and bridge projects are planned for FY 1996/97. Key projects include bridge repairs to address seismic retrofit concerns, bridge replacements, road reconstruction, and box culvert installations. Continued storm damage repair, pothole patching, and heavy maintenance associated with the 1995 flooding is also ongoing. Nearly 60 miles of County roads were chipsealed in August. This section also administers traffic count studies and a sign replacement program. A pavement management system will be developed to rate the condition and sufficiency of all County roads; this allows for accurate and objective determination of project priorities and allocation of dwindling resources when they are most needed.

County Surveyor

As required by County and State Code, the surveyor performs plan and map checking for subdivisions, parcels, and other land improvements. In addition to performing survey work, the surveyor coordinates with the Technical Advisory Committee, assists with use permitting, and works with the development of the Land Division Standards.

Solid Waste

The California Regional Water Quality Control Board Order Numbers 88-036 and 93-200 and Title 14, Division 7 of the California Code of Regulations govern the activities at the Tehama County landfill. Staff must also comply with Public Resources Code Division 30 for development and implementation of recycling plans for the County.

Transportation Commission

The transportation division of Public Works provides for the County's unmet transportation needs through the Medical Emergency Transportation Service (METS) and administers the VanTrans program jointly for the City of Red Bluff and the County. Other key duties include:

- Monitor and ensure compliance with federal and state transportation regulations and funding source requirements
- Coordinate ISTEA exchange program
- Monitor TDA allocations
- Development of bus system
- Assist Caltrans with RTIP and STIP
- Coordinate and evaluate TEA projects
- Development of Master Bikeway Plan

Tehama County Sanitation District No. 1 (Mineral)

The Mineral Sanitation District provides operation and maintenance of the Mineral sewer system. Currently, the Mineral area has a Cease and Desist Order and no additional structures can be added to the system until major construction improvements can be made. These improvements have been engineered and are currently under construction. The District also is proceeding with Assessment District development, obtaining interim financing, monitoring compliance with the Cease and Desist Order, and producing and tracking billing.

5.5.C Tehama County Resource Conservation District

The Tehama Country Resource Conservation District (RCA) provides onsite planning and implementation assistance to landowners on a voluntary basis. The RCD is authorized by Division 9 of the California Public Resources Code to develop resource conservation plans with landowners, 'secure the adoption of conservation practices, including but not limited to, farm range, open space, urban development, wildlife, recreation, watershed, water quality, and woodland, best adapted to save the basic resource, soil, water and air of the state from unreasonable and economically preventable waste and destruction. RCDs are organized to cooperate with agencies of the United States, this state, counties, cities, public districts and other persons and groups. The Tehama County RCD can provide individual landowners and the Mill Creek Conservancy with assistance in the development and implementation of a watershed-wide resource management plan and offers technical assistance to landowners in planning and implementing riparian restoration projects.

5.5.D USDA Natural Resources Conservation Service

The Natural Resource Conservation Service (NRCS) formerly known as the Soil Conservation Service, works through local agencies such as RCDs, to provide technical assistance and sometimes funding to landowners, groups, and other agencies. The mission of the NRCS is to help use and provide conservation treatment of the land in harmony with its capabilities and limitations. To carry out its mission, the NRCS has a nationwide network of conservation specialists to help people understand and protect the land and water resources while they use them beneficially. Staff typically includes Soil Conservationists, Range Conservationists, Engineers, Soil Scientists, Agronomists, Plant Materials Specialists, Foresters, Geologists, Biologists, and other disciplines depending on project needs. NRCS concentrates its programs and assistance on non-federal private land. Landowners typically receive NRCS assistance working through local RCDs. The NRCS has established technical standards for common practices that are Best Management Practices accepted by many other agencies. Programs and assistance provided by NRCS includes: Soil Survey, Land Resource Planning, Resource Inventories, Development of Best Management Practices, Educational Programs, Plant Material Program, Watershed and Water Resources Planning Program, Public Law 566 Small Watershed Protection Program, Emergency Watershed Protection (EWP), Wetlands Reserve Program (WRP), Important Farmland Protection Act support, Identification of Highly Erodible and Wetlands, and the Environmental Quality Improvement Program (EQIP-A costshare assistance program). As the Mill Creek Conservancy watershed planning strategy is developed, NRCS is available upon request through the Tehama County RCD to assist landowners in achieving the objectives established by the Conservancy and offers technical assistance to landowners in planning and implementing riparian restoration projects.

5.5.E University of California Cooperative Extension

University of California Cooperative Extension's mission is to develop, extend, and bring about through educational means the use of research-based knowledge to improve specific practices and technologies in its areas of expertise.

Cooperative Extension works in cooperation with county, state, and federal governments to provide local educational programs throughout California. Cooperative Extension has research support and staff expertise in agriculture and natural resources, youth development, family and consumer sciences, and community resource development.

5.5.F Quincy Library Group

The Quincy Library Group prepared a Community Stability Plan and Map which designated the Mill Creek Watershed as an area of deferred study. The designation was to allow a 5-year period for additional study without threat of logging. To date, the USFS was complied with that designation and only minor salvage logging and fuel reduction projects have occurred in the Mill Creek Watershed. The Quincy Library Group has been successful in lobbying for federal funding for local projects consistent with their Community Stability Plan. This year funding was approved for forest health projects in the Lassen/Plumas/Tahoe Forest including watershed restoration projects, fuels reduction, and timber stand improvement projects.

5.5.G Sacramento River Discovery Center

By educating people of all ages, the Sacramento River Discovery Center hopes to help people become more aware of the complex relationships between the land and the river. With the interactive programs and displays, visitors can learn about the land, the river, and mankind's effect on both.

Working with school groups is also important to the Discovery Center. The Discovery Center has interactive displays in the center, the 2-acre Discovery Garden featuring native and drought tolerant plants, riparian, wetland and oak woodland walks, and even a group campground for outdoor education, family, or community gatherings. Currently, the Discovery Center is building a group campground that will serve up to 100 people. Ongoing research and restoration projects are also at the Discovery Center site.

The Discovery Center coordinated a high school/college natural resources academy. Through this program, students become involved in partnerships with businesses and agencies to learn about work and the natural world. The businesses gain additional assistance with their projects and students apply their learning to real-world situations. The Sacramento River Discovery Center is a wonderful resource for our region, helping teach people of the importance of the river and its connection to their lives.

5.5.H Sierra Nevada Ecosystem Project

The Sierra Nevada Ecosystem Project (SNEP) includes a four-volume document that was prepared as a Final Report to Congress over a 3-year period. It was written and edited by SNEP Science Team and Special Consultants. The preprint was released in June 1996 and the document is managed by Centers for Water and Wildlife Resources, University of California.

The impetus of this report is an outcome of the political/economic/ environmental debate regarding the fate of the old growth forest of the Sierra Nevada. The House Committee called for a comprehensive ecosystem assessment of the entire Sierra Nevada.

The critical value of the aquatic and terrestrial habit in the Mill Creek Watershed was acknowledged in the SNEP report. The report identifies Mill Creek as having the highest biotic integrity of the 100 major watersheds in the Sierra Nevada and recommends establishment of an "aquatic diversity management area "(ADMA) to protect the watershed's aquatic resources. The report also identifies much of the Mill Creek Watershed from its headwaters to the foothills as an "area of late successional emphasis" (ALSE), which is considered crucial for the long-term maintenance of old growth forest dependent species. The SNEP findings will be considered in any long-term management scheme which amends the LRMP, including permanent strategies derived from the USFS's PACFISH watershed analysis or as site-specific implementation of the Cal Owl EIS.

The Mill Creek Watershed is within the Cascade range; however, it is a unique transitional zone between the Cascades and the Sierra Nevada. The report addresses old growth forest and Sacramento chinook salmon bearing streams; therefore, Mill Creek was included in the report. To date, local landowners and the Mill Creek Conservancy have not been contacted regarding the report process or the implementation of the management strategies. To date, it is unclear how the information within the report will interface with existing USFS management direction or influence private property management.

5.5.I CALFED Bay-Delta Program

The CALFED Bay-Delta Program is a three-phase effort to develop a long-term solution to problems affecting the San Francisco Bay / Sacramento-San Joaquin Delta estuary (the Bay-Delta) in Northern California. The CALFED process is a joint effort by state and federal resource agencies to determine a Delta solution that improves fish habitat and passage while increasing the ability to provide reliable water deliveries.

The Program addresses four categories of Bay-Delta issues:

- Ecosystem quality
- Water quality
- Water supply reliability
- System vulnerability

Phase I (June 1995 through August 1996) identified issues, developed a mission statement and several guiding principles, and designed three alternative solutions. The Delta alternatives includes four common programs related to water use efficiency, ecosystem restoration, water quality, and system integrity. Delta conveyance and water storage provide the primary difference between the alternatives. Following is a brief summary of the alternatives:

- Alternative 1—Existing system conveyance through the Delta with minor capacity improvements
- Alternative 2—Modified through the Delta conveyance with two modes of increased capacity
- Alternative 3—Dual Delta conveyance with increased capacity through Delta and isolated facility

Phase II (from June 1996 through September 1998) involves conducting a broad-based environmental review of the three alternatives and identification of the preferred alternative.

Phase III (1999 - ?) is the implementation of the preferred alternative.

Proposition No. 204, a $1 billion bond act on this November's ballot, will provide initial state funding of the final solution. Federal funding and construction monies are to be determined later. The public input process, while extensive, has been on an ambitious schedule which was designed by CALFED staff. Mill Creek Conservancy representatives are monitoring this process carefully and are involved with a Tehama County CALFED discussion group.

5.5.J Sacramento River Watershed/Toxic Program

The Sacramento River Watershed Program (SRWP) is a new program which consists of many individual programs, projects, and specific tasks. The SRWP was initiated by EPA, the Central Valley Regional Water Quality Control Board, and the Sacramento Regional County Sanitation District (Sacramento County). Funding to initiate the program was appropriated by the U.S. Congress and is being managed by EPA through a series of grants to Sacramento County. The vision for the program is that it will be continual, with no finite endpoint. The goal of the program is to ensure that current and potential uses of the water-

shed's resources are sustained, restored or, where possible, enhanced, while promoting the long-term social and economic vitality of the region.

The SRWP has held three meetings in Sacramento as part of initial outreach efforts to other stakeholders in the watershed. More than 200 individuals representing federal, state, and local agencies and interest groups are currently participating in the program. These individuals adopted the name "Sacramento River Watershed Program" and the above goal statement at the last general meeting. Because outreach has just begun and the program is still in its infancy, all decisions, such as the adoption of the goal statement, will be reviewed annually.

The group has made several additional recommendations. First, that the program will focus on information exchange to connect existing and potential projects. The program will be made up as a communication network to increase understanding and promote the sharing of information, as well as enable co-adaptation and self-coordination. The intention is that this effort will result in an increase in group synergy and allow a "cross pollination" of creative energy and ideas. The intention is not to control or direct ongoing local stewardship efforts. Finally, the group has recommended that a watershed-wide monitoring program be implemented to assess the condition of the entire watershed and that this monitoring be used to support the watershed management effort. The design of this monitoring program is also in its infancy, but will focus on linking existing monitoring efforts and filling gaps in our collective knowledge and understanding of the watershed's condition.

5.6 Environmental Evaluation and Permit Requirements

5.6.A National Environmental Policy Act

5.6.A.1 Legislation

The National Environmental Policy Act of 1969 (NEPA) was signed into law and became effective on January 1, 1970 (NEPA Section 2). The intent of NEPA was to declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality (CEQA).

NEPA applies to all federal agencies and most of the activities they manage, regulate, or fund that affect the environment. Even though NEPA applies to federal agencies, its implementation involves state agencies, local governments, Native American tribes, third-party contractors, interest groups, and concerned individual citizens.

In addition, agencies must integrate NEPA with other environmental laws. Basically, any actions or projects that fall under NEPA are also likely to fall under a number of other federal and state environmental laws. Depending on the nature of the proposed project, it might also need to comply with, for example, the Endangered Species Act if it is an activity that would affect an endangered species; or the National Historical Preservation Act if it affects historical and archaeological resources.

Two federal agencies have responsibility for administering, overseeing, and reviewing the implementation of NEPA by other agencies: the CEQ and the EPA. A more detailed description of the NEPA process is provided in Appendix AA.

5.6.B California Environmental Quality Act

5.6.B.1 Legislation

The California state law establishes a policy for environmental protection. The California Environmental Quality Act of 1970 (CEQA) process requires state and local agencies to consider the environmental impacts of a proposed project prior to approving the project. It allows decision makers to be aware of the significant alterations to air, water, and land that a particular project may cause. All state and local agencies, governmental projects, and private projects which require government approvals are subject to the requirements of CEQA.

The CEQA environmental review process begins with an initial study in which an agency reviews a proposal to determine if the project will have significant impacts. If it is determined that there are no significant impacts, a Negative Declaration is issued and the project is approved (sometimes with mitigation measures required). If the project is predicted to have significant impacts, an EIR is required to be compiled. The purpose of the EIR is to provide information to decision makers regarding environmental consequences, to allow review of project details, and to suggest ways in which adverse impacts may be avoided through mitigation measures. The mitigation requirement in the law is a particularly strong statement. Because of the approval of AB 3180, agencies are forced to develop mitigation monitoring programs to ensure that required mitigation measures are being enacted. The environmental review process enables California to meet the goal described in CEQA to maintain a quality environment for the people of today and tomorrow.

5.6.B.3 Agency Responsible for Regulation and Enforcement of Legislation

In general, there are two state agencies that are responsible for the administration and oversight of CEQA. These are the Governor's Office of Planning and Research and the Resources Agency. The Governor's Office of Planning and Research (OPR) is responsible for the drafting of the State CEQA Guidelines. The Resources Agency is responsible for rule-making, certification, and adoption of the State CEQA Guidelines, which are the official interpretations of CEQA. The Guidelines include not only the provisions required by CEQA, but also interpretations of case law, concepts based on NEPA and other helpful guidance to public agencies.

5.6.C Timber Harvesting/Salvage Permits

Timber harvest on Lassen National Forest lands within the watershed is governed by numerous laws and resulting regulations including NEPA, the Multiple-Use Sustained Yield Act, and the Forest Management Act. More local guidance is provided for by the LRMP. Currently, timber harvest activities within the basin comply with interim direction for management of the CASPO and PACFISH.

With few exceptions (small scale projects for which categorical exclusions apply) planning of all activities on USFS lands, including timber harvest plans, are subject to public review and comments, and appeal of decisions regarding the selected action. At present, under the terms of the Recision bill, salvage sales are not subject to appeal, and public review time is

shortened. The laws and regulations governing USFS activities are equivalent to Timber Harvest Plans required on private lands.

5.6.D Grazing Allocation Permits

The USFS manages grazing permits, also known as Allotments, for public land within the Mill Creek Watershed. The grazing permit process is addressed under the Range section of the LRMP. The current range management objectives on the forest include:

- Manage range vegetation to protect basic soil and water resources, provide for ecological diversity, improve or maintain environmental quality, and meet public need for interrelated resource uses.
- Integrate management of range vegetation with other resource programs to achieve multiple use objectives contained in the Forest Plan.
- Provide for livestock forage, wildlife food and habitat, outdoor recreation, and other resource values dependent on range vegetation.
- Contribute to the economic and social well-being of people by providing opportunities for economic diversity and by promoting stability for communities that depend on range resources for their livelihood.
- To provide range expertise on range ecology, botany, and management of grazing animals.

The LRMP also lists several Management Conflicts including grazing conflicts, traffic hazards, nesting disturbances, management intensity, and techniques that are addressed at the specific permit level. In addition to the management objectives and the mitigation of the management conflicts, Congress passed the "Recession Bill" in 1995. This bill requires the USFS to establish a schedule over a 15-year period in which an environmental analysis is completed on each allotment prior to issuing a new grazing permit. This analysis will make the decision if grazing is a compatible resource use and if so determine the grazing strategy that will be implemented, mitigation measures needed to protect specific resources, and standards and guidelines that are consistent with the above mentioned management objectives.

5.6.E Stream Alteration (CDFG and Tehama County Permits)

Any person, agency, or entity proposing to do work in or near a river, stream, or lake, must first notify the CDFG prior to start of operations. The purpose of notification is to allow for review of the project proposal so that damage to fish and wildlife, their habitat and/or water quality is minimized. If circumstances are found that must be mitigated, conditions may be placed on the project to afford adequate protection during construction.

The intent of the law is to apply reasonable guidelines on project proponents so as to ensure preservation of the peoples natural resources during conversion of the resource for alternate use. Failure to comply with the notification requirement, and/or conditions set forth in the subsequent agreement, is a violation of law and carries substantial legal ramifications including civil, and/or criminal consequences.

Procedure for compliance with the stream or lake alteration notification/agreement process, pursuant to CDFG code Section 1600 - et. al., is as follows: CDFG is notified in writing, describing in detail the project being proposed, the body of water affected, geographical location, construction methods and measures to be taken for resource protection.

Upon receipt of this information by CDFG, a representative, usually a law enforcement officer, will contact you and arrange for an onsite inspection. During this inspection, potential problems are identified and corrective measures developed, deliberated, and reviewed.

In conclusion, provisions for protection of the resource are included in the stream alteration agreement document which is prepared by the representative and signed by both parties. The project is then authorized to proceed subject to the conditions.

Tehama County Code, Chapter 9.16 obtains local water course regulations, County Code chapter was established in 1973 and declares it a public nuisance for any person to maintain a watercourse in any condition which is adverse or detrimental to the public peace, health, safety or general welfare. Thus, any watercourse cannot be maintained in such a condition where accumulation of debris, weeds, brush, trees or other material may obstruct, impair or impede passage of water and cause flooding which may be injurious to neighboring property or life. This Code section is also violated when dams, fences or other structures are constructed or maintained which obstruct, impair or impede passage of water through the water course and cause neighboring impacts.

If, after a public hearing before the Board of Supervisors, the property owner does not abate the nuisance, the Tehama County Flood Control and Water Conservation District is granted the authority to abate the problem, the costs of which are levied as a special assessment against the property.

SECTION 6.0

Mill Creek Watershed Management Strategy

The culmination of the WAC's Scoping Study process was to develop a watershed management strategy report. The WAC investigated and documented the existing conditions, developed information regarding existing resource protection measures and monitoring programs, identified critical issues, and used this information to formulate appropriate recommendations. The information in this report is the assessment of the WAC members regarding the condition of the watershed and a recommendation of needed actions in the future to retain and enhance the outstanding resource qualities of the Mill Creek Watershed. A watershed management strategy is not a static document rather it is a tool to guide actions that are consistent with the project's mission statement.

6.1 Determine Resource Issues

During the first WAC meeting, significant discussion occurred regarding important resource issues. The WAC agreed to take an ecosystem approach to reviewing information and making recommendations. However, it was felt that special focus to salmon and steelhead was necessary due to their state of peril. The WAC agreed to a definition of the area to be considered, the Mill Creek Watershed, which is depicted in Figure D-1 (Appendix D).

The WAC developed a list of unresolved resource issues and concerns regarding the Mill Creek Watershed. During a brainstorming exercise, 25 separate goals were developed by the group. A weighting exercise determined the ranking of each item. The highest rated goals included:

- Permanent monitoring programs
- Increasing anadromous fish productivity and sustainability
- Improving wildlife habitat
- Reducing sedimentation and erosion problems
- Educating and involving students and community in stewardship

A complete list of the 25 goals is contained in Appendix C. The goals were grouped in categories with appropriate strategies. These goals and strategies were presented at the community meeting for additional input and ideas.

The resource issues were refined into goals and strategies during the Scoping Study process. The goal and strategies can be used to review and evaluate future watershed projects. The refined goals were reviewed at the Community meeting for input. The major concerns expressed at Community meeting related to:

Listed below are the WAC goals and strategies for the Mill Creek Watershed in an easy to use outline format, but does not represent the priority of the item:

- General
  1. Develop a realistic landscape description for the watershed
  2. Reduce trespassing and preserve private property rights
  3. Manage undeveloped areas as biotic reserves
  4. Understand the dynamics of the watershed
- Education
  1. Educate and involve local students as well as the local community in the stewardship of the watershed.
  2. Provide mentoring and job sharing opportunities for students
  3. Enable appropriate private property access for authorized student studies
- Water
  1. Reduce sediment, erosion, soil disturbance (develop fire, grazing, road plan)
  2. Improve efficiency of water distribution system and increases water availability for instream flows
- Wildlife
  1. General
     a. Improve wildlife habitat
     b. Understand the wildlife needs in the watershed
     c. Protect and restore habitat for threatened, endangered, and sensitive species
  2. Fish
     a. Develop a permanent, ongoing, real-time monitoring program for spring-run outmigrants
     b. Increase wild anadromous fish productivity by improving spawning habitat in the lower canyon and ensuring adequate annual transport flows
     c. Understand the key problems affecting fisheries
     d. Reduce poaching, especially on spring-run chinook and steelhead
- Vegetation
     e. Restore and maintain native vegetation, especially in riparian zones
     f. Create riparian habitat restoration areas open to the public
- Recreation and Commercial Activities
  1. Maintain recreational and commercial activities in the watershed at their present levels or reduce them, while minimizing their negative environmental impacts to the greatest extent possible—especially upon legally declared or de facto endangered species

At the end of Chapters 3, 4, 5, and 6 there is a listing of data gaps and needed information. The list identifies items that are not contained within this report due to availability of expertise and project parameters. The list will be useful in developing additional information for the watershed management strategy updates. The acquisition of the data gap information would be consistent with the WAC goals and strategies.

6.2 WAC Recommendations

1. The WAC should meet annually to discuss current resource protection issues and to review and comment upon Watershed Management Strategy.

2. The WAC subcommittees should continue resource protection efforts that are consistent with the WAC mission statement and shared goals. Committees shall prepare a progress report for the WAC annual meetings.

   a. Fire Committee should pursue Mill Creek Fire Plan.

   b. GIS Committee should advise Mill Creek Conservancy regarding the use of current data and future mapping needs.

   c. Revegetation Committee should pursue revegetation/restoration projects which use native plants.

   d. Water Quality Committee should support student monitoring efforts.

3. Mill Creek Conservancy should review the Watershed Management Strategy Report and use the appropriate information and recommendations to determine project and program priorities. Mill Creek Conservancy should consider an Implementation/ Work Program based on WAC recommendations that include key indicators of watershed health and measurable objectives.

4. Mill Creek Conservancy should prepare an annual Watershed Management Strategy Report update which would include new information and status of projects for the annual WAC meeting.

5. Mill Creek Conservancy should review the USFS Watershed Analysis once completed and incorporate appropriate information into the Watershed Management Strategy Report update.

6. Mill Creek Conservancy should monitor PACFISH/CASPO amendment procedure and management practices to ensure adequate resource protection measures are adopted.

7. Mill Creek Conservancy should review Meadowbrook Road Inventory and incorporate appropriate information into the Watershed Management Strategy Report update.

8. Mill Creek Conservancy should closely tract the status of the potential endangered species listing of the steelhead/spring-run chinook salmon.

9. Mill Creek Conservancy should monitor projects and comment on documents that have the potential to impact the watershed, including the reauthorization of the Clean Water Act.

10. Mill Creek Conservancy should investigate/analyze methods to secure additional instream flows without impacting irrigation water supplies.

11. WAC/Mill Creek Conservancy should secure and distribute Best Management Practices brochure to provide educational information on proper use and disposal of chemicals and wastes.

12. Mill Creek Conservancy should obtain and distribute information regarding conservation easements and riparian reserves to encourage resource protection measures by private landowners.

13. Mill Creek Conservancy should review the Sacramento River Pollution Project and determine if the project could provide additional water quality monitoring testing for Mill Creek.

14. Mill Creek Conservancy should support the CDFG and the USFS projects and programs that improve fish and wildlife habitat.

15. Mill Creek Conservancy should support permanent secured funding for "real time monitoring" for the entire life cycle of all anadromous fish within Mill Creek.

16. Mill Creek Conservancy should work closely with the LMUSD to encourage student stewardship of the watershed.

17. Mill Creek Conservancy should continue to work with Americorps, The Nature Conservancy, and LMUSD to develop water quality and streamflow monitoring programs, revegetation programs, and other resource programs beneficial to students and the watershed.

18. Mill Creek Conservancy should pursue coordination of grant funding for specific watershed projects that meet Watershed Management Strategy criteria.

6.3 Implementation Plan

The information contained in this report is a snapshot of the WAC's assessment of the condition of Mill Creek Watershed during the 1996 Scoping Study sessions. The report also contains the Mill Creek WAC's recommendation for future actions. The information contained in this report will have to be augmented and updated in order to be an effective resource management tool. The key players in the management of the Mill Creek Watershed are the landowners and local community, represented by the Mill Creek Conservancy, and the Mill Creek Conservancy MOU partners including, but not limited to, LMUSD, USFS, CDFG, DWR, Tehama County, and conservation organizations. Many of these agencies and groups have their own resource implementation plans. An implementation plan for the Mill Creek Watershed must be dynamic and responsive to changes in order to be comprehensive in nature.

Implementation involves putting policies into action. Monitoring is an important function of the implementation process, which is discussed in Section 6.4. A 1997 implementation

plan will be designed and approved by the Mill Creek Conservancy that will use the information and recommendations contained in this report.

6.3.A Mill Creek Conservancy

The Mill Creek Conservancy initiated the Scoping Study process in order to formulate a Watershed Management Strategy with participation by all interested parties. This report is the result of information developed during the Scoping Study sessions and contributions by participants. The recommendation section is an essential tool to guide and measure the implementation plan.

The Mill Creek Conservancy will use the information contained in this report and the recommendations to review and update the Mill Creek Conservancy 4-year work plan. The plan is reviewed and updated annually. It is a guideline for measuring the Conservancy's effectiveness and determining the level of effort for specific projects. A copy of the Mill Creek Conservancy 1996 - 1999 Work Program is contained in Appendix ___.

The Mill Creek Conservancy will continue to oversee and coordinate the continuing development of the GIS maps. Additional information and applications for the use of the mapping tool will be considered and used by Mill Creek Conservancy for resource protection measures. LMUSD will have full use of the GIS materials and computer.

There are several ongoing implementation activities that have been initiated since the Scoping Study process started at the beginning of 1996. The activities include the Mill Creek Conservancy ongoing involvement with the Educational Component with hands on resource projects, the development and use of the Mill Creek GIS maps, and the cooperating role of Mill Creek Conservancy in obtaining a revegetation grant from USFWS.

The Revegetation Committee has been successful in obtaining a grant for restoration of riparian vegetation on the lower reach of Mill Creek. The grant includes the creation of a demonstration site which the students will monitor for a three year period.

The Conservancy is the manager of the Mill Creek Watershed Management and Educational Component of the Lassen Watershed grant. The Conservancy will continue to provide support to the Educational Component throughout the grant period until 1999.

In addition to the efforts mentioned above, the Mill Creek Conservancy is also involved in additional activities that should be included in the implementation plan. A main component of the Mill Creek Conservancy's philosophy is that of coordination and cooperation. Mill Creek Conservancy strives to work with both the USFS and Tehama County, the legal land use entities, and their respective plans to achieve a proper course for the long-term management and protection of resources within the watershed.

The Mill Creek Conservancy is an active participant in the PACFISH amendment process. Mill Creek Conservancy will continue to monitor the USFS's policies, programs and budgets to ensure that adequate protection for Mill Creek is a priority of the USFS. In addition, Mill Creek Conservancy will review the CALSPO information when it is available.

The Mill Creek Conservancy will continue to monitor potential projects within the watershed. The Mill Creek Conservancy monitors potential projects and programs that may impact the watershed. The Conservancy has an arrangement with the Tehama County Planning Department to provide notification of any projects within the watershed. Any

project that has the potential to impact Mill Creek Watershed would be subject to a careful review by the Conservancy. The Conservancy would develop a recommendation regarding the project and request for appropriate conditions to mitigate impacts from the project.

The Mill Creek Conservancy also comments on numerous documents to ensure that accurate information is reflected, and that our position and concerns are part of the record. These documents are generally used for management direction and could create support for specific types of action or ignore important issues. The range of documents is listed in Table 6-1.

It is critical that the Conservancy members read the material and documents regarding the management of Mill Creek to stay informed and involved in resource protection matters. It is necessary to review the information and develop a consistent response to ensure that the local voice for resource protection is always heard.

TABLE 6-1
Documents that Could Impact Mill Creek

Agency	Description of Document
U.S. Forest Service	Lassen Resource and Management Plan, PACFISH interim and long-term planning documents, CASPO
Fish & Game Commission	Petition to list Spring-Run Chinook Salmon, Monitored Species Programs
California Department of Fish and Game	Action Plan, Status Report on Salmon, Steelhead Management Report
U.S. Fish and Wildlife Service	Anadromous Fish Restoration Plan
State Water Resource Control Board	Water quality standards
CALFED	Water standards and agreements
Tehama County	General Plan, Groundwater Management Plan, Zoning Ordinances

The Mill Creek Conservancy will continue to support programs that enhance Mill Creek Watershed. In addition to keeping a critical eye on program development, it is equally important to provide support to programs that enhance the Mill Creek Watershed. Our partnership with the Los Molinos School District will continue to expand to provide additional opportunities for the students. The Conservancy is proud of our working relationship with the CDFG and are looking forward to a successful continuation of the water exchange program and additional projects. A recent example of our supportive role is a private landowner allowed the installation of a CDFG thermograph in an area that is accessible to personnel and will not be tampered with by the public. DWR provides extensive information and support to the Mill Creek Conservancy for the development of our GIS maps. The USFS has provided an outstanding level of effort in the participation in the Scoping Study and in the preparation of this report.

6.3.B Los Molinos School District—Educational Component

6.3.B.1 Lassen Watershed Project

As part of the LMUSD Partners in Education program, the Lassen Watershed Project focuses on the watersheds of the eastern Cascade range. Two of the streams within this

tion will be used to document conditions of the streams and associated watersheds. Pictures, videos, and reports will be used to document and record processes and progress.

Revegetation Project. The Los Molinos School District will implement riparian vegetation projects at selected sites on Mill and Deer Creek. Project sites will be selected based on information gathered during the Scoping Study process and the priorities will be established by the Deer and Mill Creek Conservancies. Under the direction of professional staff, students will grow and plant saplings and native grass seedlings as necessary to facilitate the projects. In addition to District students, the California Conservation Corps - Tehama County Americorps crew could be contracted to assist in the revegetation projects. The project will use an existing greenhouse at Los Molinos High School.

6.3.B.3 Los Molinos Student Projects

This report references specific Lassen Watershed Project education activities as of September 1995 through December 1996. In addition, the report establishes project priorities through June 1997.

Although this report is addresses the Mill Creek program, the educational projects, curriculums, budgetary investments, and outcome activities support both Mill Creek Conservancy and Deer Creek Watershed Conservancy projects. Programs and activities have been customized for each watershed.

In an attempt to design a K-12 watershed education program the PIE staff developed a sequenced K-12 pilot project articulated with the state science frameworks and high school program standards.

6.3.B.4 Watershed Education Program

The curriculum implemented for the K-12 Watershed Education Program for LMUSD uses the resources of the watersheds to present hands-on education within a strategy of service learning and community stewardship. A list of the curriculum sequences used by LMUSD during the first year of the Lassen Watershed Project, and a list of proposed activities for the 1996-97 school year is provided in Appendix N.

Students from the high school art class competed to design a logo for the watershed conservancies. Mill Creek Conservancy members awarded cash prizes for the first, second and third place winners.

- Both Mill and Deer Creek meetings are attended by student study teams who served to video the proceedings. Students also report on various student projects including an update of water quality work. PIE Staff, High School Ag Staff, Americorps Members, and students attended the Mill Creek field day, which focused on lower Mill Creek issues.

6.3.C Watershed Advisory Committee

Four major work groups were formed in the course of the Scoping Study sessions. The work groups include Fire, GIS, Revegetation and Water Quality Monitoring. The work groups met during the Scoping Study sessions and at other scheduled meetings to discuss specific items. The work groups may continue to meet beyond the scope of this grant and carry out projects that relate to their specific area of expertise.

6.3.C.1 Mill Creek Watershed Fire Committee

The Mill Creek Watershed Fire Committee has met several times since the first of the year. The first meetings were held with members of the California Division of Forestry (CDF) in conjunction with Deer, Antelope, and Mill Creek landowners. The primary effort was to institute a mapping and notification process that would increase CDF's ability to respond to fires more efficiently, faster, and without confrontations with landowners concerned with excess backfiring. CDF has provided extensive aerial photography and mapping that has allowed landowners to designate key access roads and entry points. A list of landowners to contact for assistance to access specific areas is now available to CDF. A discussion of concerns provided all participants with a better understanding of the problems. If a major fire occurs, a landowner representative will be contacted to discuss impacts with the fire control team.

The Fire Committee members are listed in Table 6-2.

TABLE 6-2
Fire Committee Members

Member	Affiliation
Burt Bundy	Mill Creek Conservancy
Bill Brown	Mill Creek Conservancy
Pete Rude	CH2M HILL
Mark Parson	Tehama County Resource Conservation Service
Larry Branham	Tehama County Resource Conservation Service
Mike Mitzel	Sierra Pacific Industries
Jack Bean	Sierra Pacific Industries
Judy Forbes	Lassen National Forest
Rocky Towe	Lassen National Forest
Peter Hujik	Dye Creek Preserve—The Nature Conservancy
Bill Hoeman	California Department of Forestry
Dave Ebert	California Department of Forestry
Chuck Scheindienzt	California Department of Forestry
Bob Steele	California Department of Forestry
Curtis Knox	Deer Creek Conservancy

Consensus Items:

- Prescribed burns, if done properly, can be successful
- Maintenance is critical to success of fire breaks
- Mill Creek Conservancy can help by advocating funding and rule changes
- GIS base map of fire history of watershed would be valuable
- Desire to connect prescribed burns and coordinate LNF, CDF, SP. Need defensible fire lines.

Later meetings with Mill Creek WAC members dealt with issues of long-term fire history and planning, coordination between governmental agencies, methods of increasing fire line maintenance needs, funding of prescribed burns, landowner participation, and regulatory

modifications needed. Ongoing discussions of issues is needed to continue progress made during initial meetings. Mark Parsons, of the National Resource Conservation Service, indicated the possibility of an east side fire strategy study.

Fire Committee Issues:

1. Vegetation varies considerably throughout the watershed. Strategies for prevention and suppression need to be developed for each based on terrain, economic values, management prescriptions, resource needs, and local concerns.
2. Fire breaks need to be delineated and developed. Responsibilities for initial clearing and maintenance must be agreed upon.
3. Prescribed burns can be an useful tool in fire management. Inherent agency reluctance for prescribed burns need to be dealt with, and funding mechanisms must be developed.
4. Management overlays need to be modified to reflect the resource impacts of devastating wildfire caused by excessive fuel loads. For example, limited prescribed burning in the Ishi Wilderness area could prevent the movement of fire from the grassland zone into the conifer areas.
5. Local landowner input needs to be used in determining long-term goals and management direction.

6.3.C.2 Geographic Information System Working Committee

Initial development of the Mill Creek Watershed GIS had three distinct, but interrelated phases. First, the extent of existing spatial data was determined and, where possible, the usefulness of the data was evaluated. This process was completed largely through a technical committee set up for this purpose. Second, watershed-based mapping products were produced that assisted in facilitating the scoping process and set the technical foundation for future work. CH2M HILL was responsible for organizing existing information and producing maps for the Watershed Advisory Committee. Finally, a watershed-based GIS should be developed that meets the needs of the Mill Creek Conservancy. The GIS should be a primary tool for information management and decisionmaking. The types of information (layers) to be included in the Mill Creek Watershed GIS and its possible uses were discussed during the Scoping Study process.

- The GIS objectives are to develop a relational database and coverages for hydrology, vegetation, soils, land use, infrastructure, and aquatic and wildlife habitats at a scale in which the data are available; provide a structure to facilitate administrating and updating coverages; produce maps of individual or combined coverages for analysis and decisionmaking; and ensure data compatibility with federal, state, and local agencies.

The abilities of the GIS for analyses and mapping are limited by the quality and scale of the data. The various participating agencies and individuals, working with CH2M HILL on the GIS subcommittee, surveyed the spatial accuracy requirements for each study element, inventoried existing data, and assessed the quality of this data to determine what was the "best available data" from which to build the various coverages for the GIS.

For the end users, however, data documentation (meta-deta) should be provided which outlines the structure and the integrity of the data. This data documentation or data dictionary should contain an overview of the database structure (description and location of the database fields) for each of the coverages, and information regarding the integrity of the data (accuracy of the data source and verification of data validity) for the non-GIS user a more technical counterpart for more sophisticated analyses.

The information contained within a data dictionary is essential also for cartographic output to minimize problems of scale and positional and relative accuracy. Output will be highly inaccurate if data are mapped at a larger scale than the data allows. Positional and relative accuracy of objects on the map will be compromised if this occurs. Because maps are the means by which information is shared with the decisionmakers and the community-at-large, the accuracy of this communication device is crucial.

While the GIS is capable of producing a variety of maps using information from the various databases, the effectiveness of the maps is limited by the above and the failure to implement cartographic principles of design. In constructing a map, the user needs to consider or be aware of these factors.

6.3.C.3 Revegetation Committee

The purpose of the Revegetation Committee is to advise the Mill Creek Conservancy on native revegetation issues by identifying priority sites and developing specific project proposals for board approval and implementation. The committee is currently composed of 11 members who are committed to serving for one year. Current committee members are listed in Table 6-3.

The committee developed the following two goals for 1996:

- Design an experimental riparian planting that will serve as a prototype for lower tributary restoration
- Identify project priorities for the next 3 years based on watershed scoping conducted by the USFS. To date, the committee has selected a site for the experimental planting, conducted a site analysis, and cultivated funding sources. During the course of the Scoping Study sessions, a formal project proposal was prepared by the Revegetation Committee and funded by the USFWS.

TABLE 6-3
Revegetation Committee Members

Role	Committee Members	Affiliation
Group Lead	Peter Hujik	Restoration Coordinator, The Nature Conservancy
Landowner Liaison	Kerry Burke	Resource Coordinator, Mill Creek Conservancy
Ecological Advisors	Mark Parson	District Conservationist, Natural Resource Con. Service
	Larry Branham	Range Conservationist, Natural Resource Con. Service
	Jules Riley	Hydrologist, U.S. Forest Service
	Matt Brown	Fishery Biologist, U.S. Fish & Wildlife Service
Technical Advisors	Bill Brown	Landowner, Mill Creek Conservancy Board of Directors
	Ray Bianchi	Agricultural Science Teacher, Los Molinos High School
	John Icanberry	Fishery Biologist, U.S. Fish & Wildlife Service
	Mark Oliver	Planner, CH2M HILL
Educational Representatives	Anne Bianchi	Director, Partners in Education
	Katie Robinson	Site-Based Coordinator, Americorps

Remaining tasks for the committee in 1996 include developing a monitoring protocol for the first-year experimental planting, assisting the Mill Creek Conservancy and Partners in Education in implementing the planting, analyzing existing and historical vegetation data, and developing recommendations of priority revegetation projects. For the duration of the grant (1997 and 1998), the committee plans to identify additional interested landowners, develop revegetation project proposals, write grants for funding projects, and assist in their implementation.

The revegetation committee plans to prioritize revegetation projects for the entire Mill Creek riparian corridor based on watershed scoping conducted by the USFS in 1996 (see the Revegetation section). For most projects, planting native vegetation will adequately stabilize denuded banks, but if more drastic measures are required they will be addressed on a case by case basis. At appropriate sites, revegetation projects will also include fencing to protect high quality riparian vegetation and water quality by excluding livestock from riparian zones. The first-year experimental planting, for example, includes a fencing component to protect existing riparian forest on the project site and reduce the potential for nonpoint source pollution.

6.3.C.4 Water Quality Subcommittee

- The subcommittee discussed ways to support and evaluate the current water quality monitoring program with the LMUSD. In addition to our monthly monitoring it has been suggested that sampling take place during and/or after flood events, and also at differing times of the day. This provides a broader range of data based on different environmental conditions.

The Water Quality subcommittee discussed the possibilities of supplementing this monitoring project with benthic invertebrate sampling, bedload transport and water flow, to again, provide a more broad picture of the factors that affect Mill Creek water quality.

The Water Quality committee members are listed in Table 6-4.

TABLE 6-4
Water Quality Subcommittee

Member	Affiliation
Dennis Heiman	Regional Water Quality Control Board, Central Valley Region
Mark Parson	Tehama County Resource Conservation Service
Tom Griggs	The Nature Conservancy
Ron Fehringer	CH2M HILL
Katie Robinson	Los Molinos Unified School District
Ken Cowley	Meadowbrooks and Associates

In addition to administrating water quality standards, the State Water Board's Division of Water Quality (DWQ) and the Regional Water Quality Control Boards are undertaking a new focused effort in watershed management that is covered under the Watershed Management Initiative (WMI). The WMI has two basic components: a staff element that directs staff work in targeted watersheds, and a grant element. As a targeted watershed, the Mill Creek watershed has benefited from both aspects of the WMI. Mill Creek watershed has enjoyed Regional Board staff support and has received a 319 Clean Water Grant that made this report and Scoping Study possible.

The key watershed management goals of the WMI are:

- Encourage and practice comprehensive natural resource stewardship that is balanced with economic and other interests.
- Promote voluntary, collaborative decision-making at the local level that is open to all stakeholders.
- Integrate point source regulatory programs, non point source programs, and other resource management programs on a watershed basis to promote effectiveness and efficiency.
- Reduce the impact of non point sources.

The Watershed Management Initiative goals are compatible with the goals of the Mill Creek Watershed Management Strategy. A copy of the WMI is contained in Appendix-

6.3.D Tehama County Groundwater Management Plan

AB 3030, the Ground Water Management Act, authored by California State Assemblyman Jim Costa (D-Fresno) and signed into law in 1992, lists 12 components that may be included in a groundwater management plan. Each component would play some role in evaluating or operating a groundwater basin so that groundwater can be managed to maximize the total water supply while protecting groundwater quality.

The Tehama County Flood Control and Water Conservation District has been designated by the Tehama County Board of Supervisors as the lead agency relative to the establishment of a coordinated AB 3030 groundwater management plan for Tehama County.

DWR Bulletin 118-80 defines groundwater basin management as including "planned use of the groundwater basin yield, storage space, transmission capability, and water in storage."

Key goals of the proposed District AB 3030 plan include the following:

- Develop a comprehensive groundwater basin management program that protects the groundwater resources of Tehama County in order to provide local users with a reliable long-term water supply
- Balance long-term average annual replenishment with extractions and other losses to the basin as may be consistent with the public interest
- Implement groundwater management plan through the development of countywide consensus wherever possible
- Develop a plan to protect basin groundwater quality

This plan will be administered by the Tehama County Flood Control and Water Conservation District (District) in cooperation with other water entities in Tehama County. Upon adoption of this plan, the District and those entities may proceed to implement the activities described under "Phase I" of this report. The various degrees of District involvement range from "Passive" (Phase I), to "Limited" (Phase II) and lastly, "Active" (Phase III). The District will attempt to limit management involvement, to the best extent possible, to those levels that are the least intrusive to local landowners. That is, District management will emphasize monitoring and basin evaluation over active management methods.

The District will coordinate administration of the AB 3030 Coordinated Groundwater Management Plan countywide. Successful implementation of the AB 3030 Groundwater Management Plan must allow proper interfacing between existing agencies in the county that are empowered with groundwater-related duties. Cooperation with these agencies is essential to a coordinated plan.

Administration of the groundwater management plan will be accomplished by District staff in cooperation with participating public agencies and will receive oversight from the District Board of Directors. The interim Management Plan Advisory Group and a permanent Technical Advisory Committee will act as advisory bodies to District administrative efforts via the Director of Water Resources or an authorized agent.

6.3.E.1 Relationship of Plan to Mill Creek Conservancy.

To protect and/or enhance the quality and quantity of water within the basin, the District plan specifies in Phase I that a basin monitoring program shall be constructed. The monitoring program may consist of the measures identified in the preliminary draft plan and will be implemented by the adoption of rules and regulations.

The District plan requires that staff prepare an annual estimate of the amount of water extracted from each basin within the plan area and of the total cumulative groundwater extractions within the basin. This shall be accomplished by estimating the cumulative total of water extracted from the basin on an annual basis by crop duty estimates, the use of a water flow measuring device, power readings or any other generally accepted methodology for reliably determining the quantity of water pumped from the basin. To the best extent

possible, existing data sources (private and/or agency pumping records, DWR Land and Water Use Reports) shall be used to develop these estimates.

The above actions will assist local and state agencies, private pumpers, and interest groups, including the Mill Creek Conservancy, towards a better understanding of the underlying groundwater resources.

6.4 Monitoring Programs

Monitoring activities were considered a priority of the WAC and have been included in the recommendation section with appropriate emphasis. Monitoring is a useful tool in gathering information regarding the status of a particular factor. Monitoring activities within the Mill Creek Watershed include water quality monitoring including temperature and flows, fish surveys, riparian vegetation surveys, etc. Monitoring programs for Mill Creek Watershed are performed by numerous organizations and agencies including LMUSD, USFS, CDFG, Timber Companies, and DWR.

The Mill Creek Conservancy supports monitoring efforts by assisting in CDFG fish surveys and the USFS. The Conservancy also has assisted the LMUSD students in obtaining permission to take water quality samples on private property.

6.4.A Los Molinos School District, Water Quality Report June 1996

6.4.A.1 Los Molinos Students—Water Quality Monitoring Program

Sponsored by the LMUSD PIE program, the Lassen Watershed Project, and Los Molinos High School faculty and students will monitor water quality to establish baseline data that describe the general health of the Mill Creek Watershed. Students who participate in these projects will gain practical experience in scientifically based field study activities. Students will have the opportunity to work with landowners, research scientists, and watershed professionals. Opportunities for job shadowing and mentorship will allow students to work in the real world on real issues.

The objectives for the Mill Creek water quality monitoring project are to provide technical training and hands on learning opportunities for students, collect monthly data from established test site locations in the lower reaches of Mill Creek, and compile baseline water quality data for use by state and federal agencies, and local organizations such as the Mill Creek Conservancy and Watershed Advisory Committee.

A Field Guide to Water Quality Monitoring by William Stapp describes everything the student need to know to perform nine basic water quality tests using Hach test equipment. It also provides a thorough background on aquatic ecosystems and how they are affected by certain pollutants. Students will receive water quality training through classroom preparation and practice field tests. Testing accuracy will also be checked by performing tests along side technicians from the Department of Water Resources, Water Quality Division.

Water quality monitoring will take place each month. Additional water quality testing will be performed after major storm events to supplement monthly data. Two local landowners, Chet Marshall and Kathy Klinestecker, have granted the school permission to use their

property as test site locations: Chet Marshall's property (Test Site No. 1) is located in Los Molinos on Wilson Road approximately 4 miles east of Highway 99. Kathy Klinestecker's property (Test Site No. 2) is located approximately 1 mile west of Highway 99 on Marek Road in Los Molinos.

Students will use Hach test kits and equipment to perform the following water quality tests: dissolved oxygen, total phosphates, total nitrates, temperature, pH, turbidity, total dissolved solids, fecal coliform and biochemical oxygen demand. Samples for water quality tests will be collected by hand in clean sample bottles in areas where water is sufficiently mixed and not stagnant. All tests will be performed immediately after sampling except for the phosphate test, which will be collected and tested within 24 hours in the school lab. Fecal coliform samples will be collected and taken to Monarch labs for processing. Test results will be recorded on field data sheets then entered into a computer spreadsheet program for future analysis.

6.4.A.2 Upper Watershed Monitoring Sites

In addition to water quality testing in the lower section of Mill Creek, the students visit the upper watershed twice a year. The filed monitoring occurs in the fall and the late spring. The students gather water quality samples from three sites, including a private ranch, Forest Service land, and a timber company's land. During field lectures, the students were encouraged to observe their surroundings and to consider the different types of land uses and the factors that could influence the water quality samples.

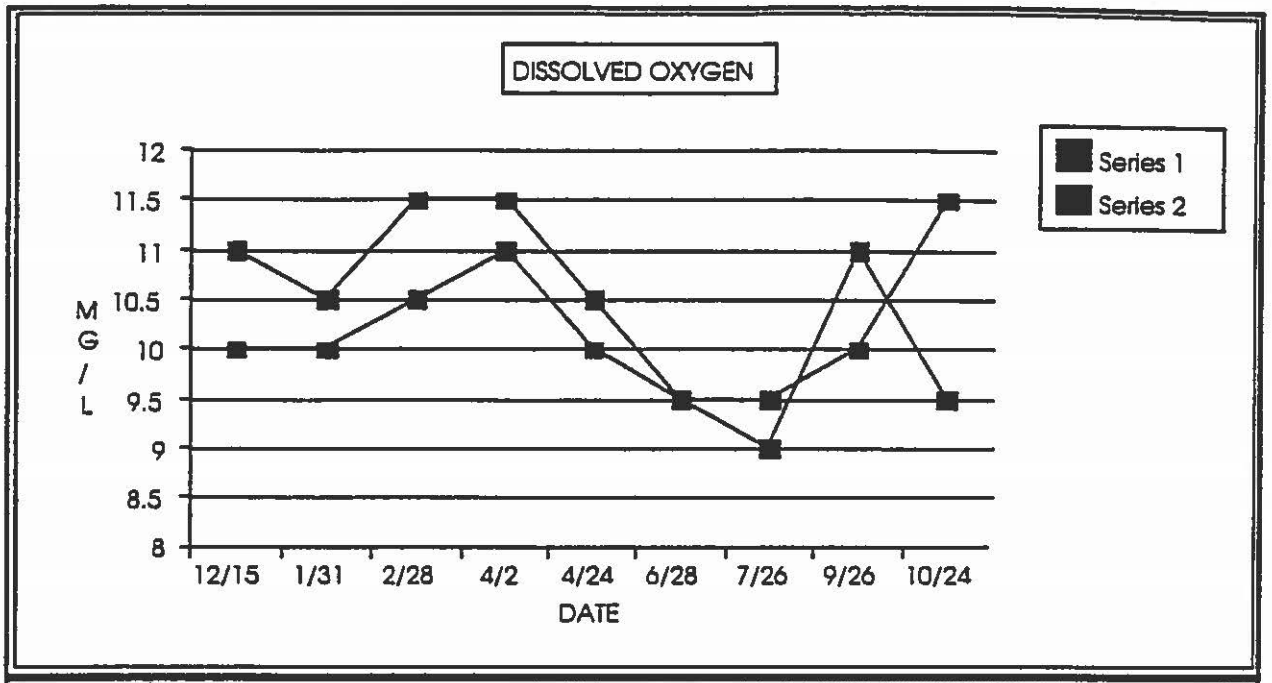
Students will use Hach test kits and equipment to perform the following water quality tests: dissolved oxygen, total phosphates, total nitrates, temperature, pH, turbidity, total dissolved solids, fecal coliform, and biochemical oxygen demand. Samples for water quality tests will be collected by hand in clean sample bottles in areas where water is sufficiently mixed and not stagnant. Tests will be performed immediately after sampling except for the phosphate test, which will be collected and tested within 24 hours in the school lab. Fecal coliform samples will be collected and taken to Monarch labs for processing. Test results will be recorded on field data sheets then entered into a computer spreadsheet program for future analysis.

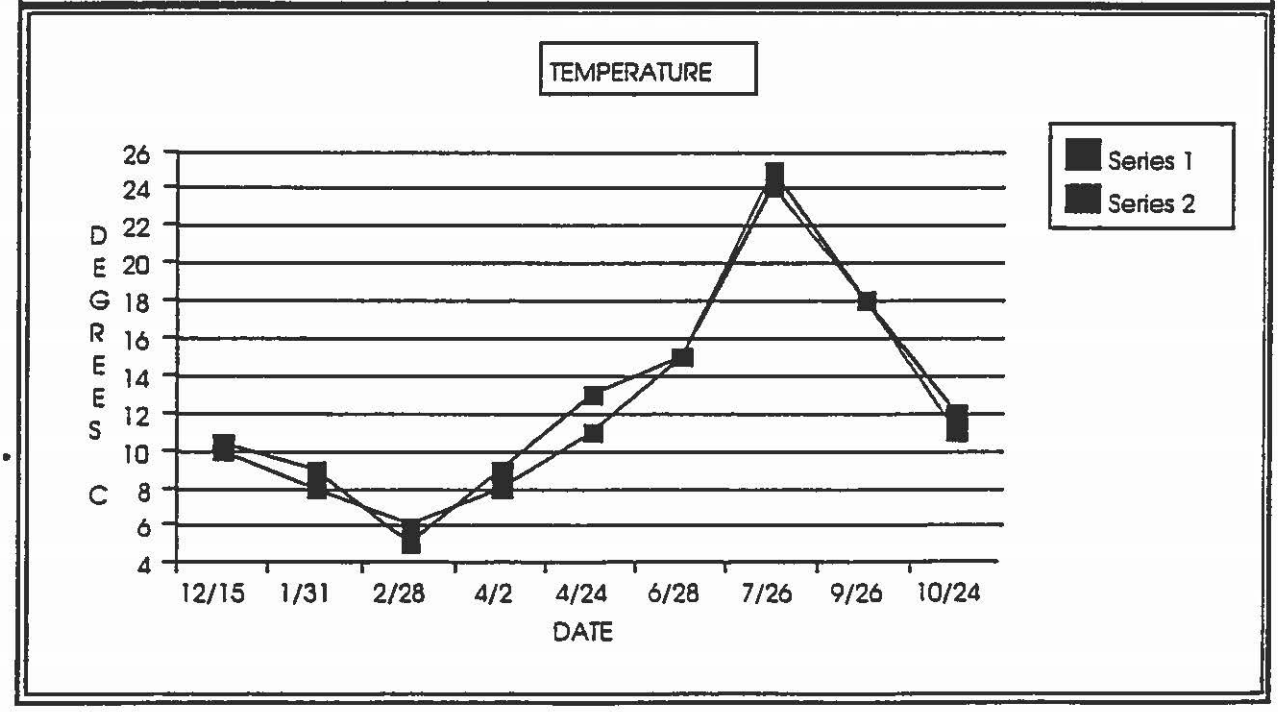
6.4.B U.S. Forest Service

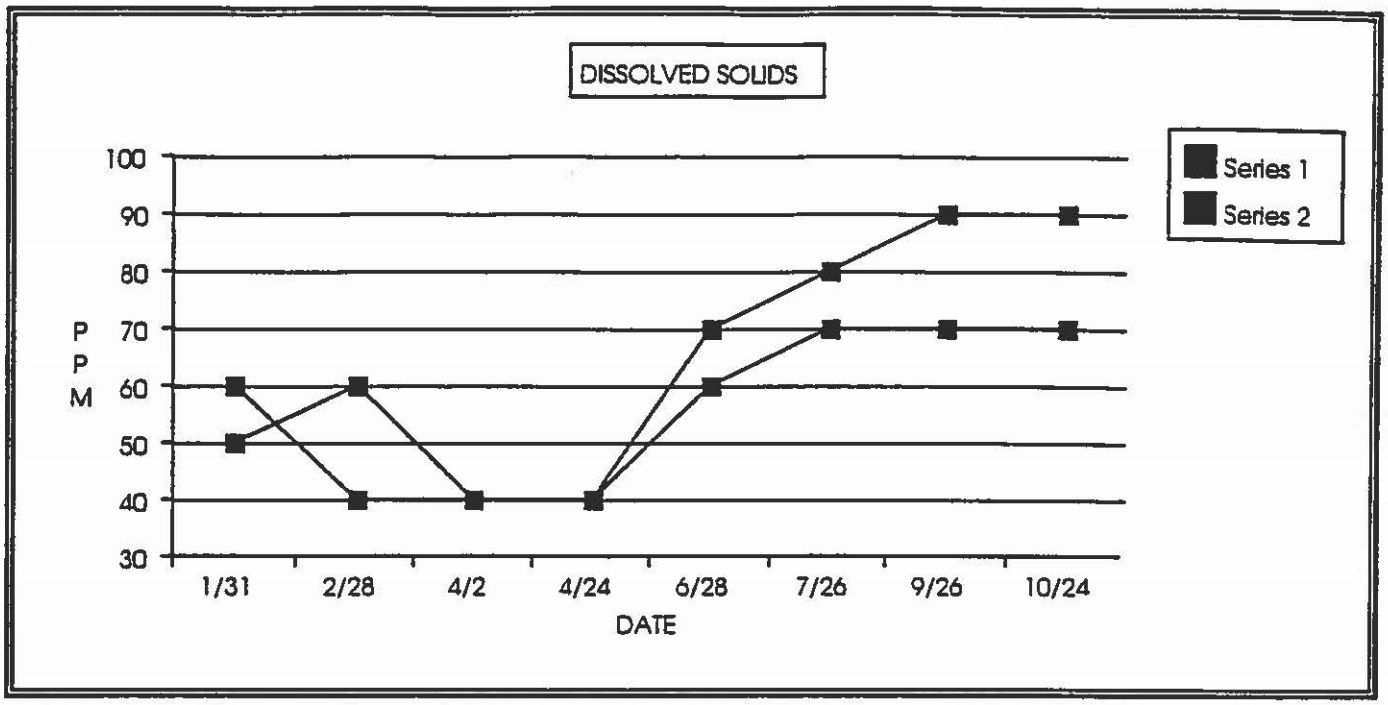
The USFS currently collects water quality samples from three main stem and three tributary stream locations near the Mill Creek summer home sites. The main stem locations are just below the Highway 36/89 Crossing, just above the Mill Creek summer home sites, and just below the Mill Creek summer home sites. Tributary sample points are located below Camp Tehama, below the camping sites, and below the summer home sites. All samples are assessed for bacteria, phosphates, and nitrates. This revised monitoring strategy went into effect this spring, following the detection of high bacteria counts in drainages within the area.

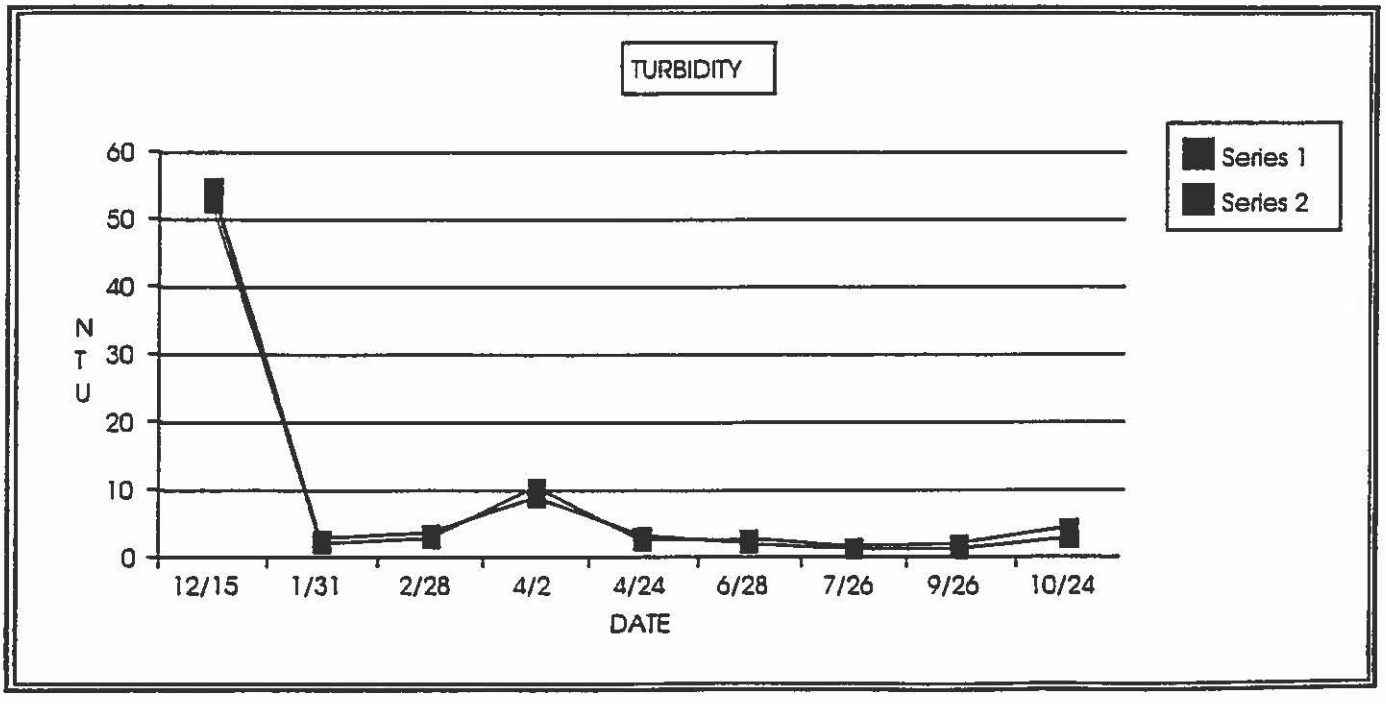
Future monitoring will be dependent on results from the existing scheme and budget.

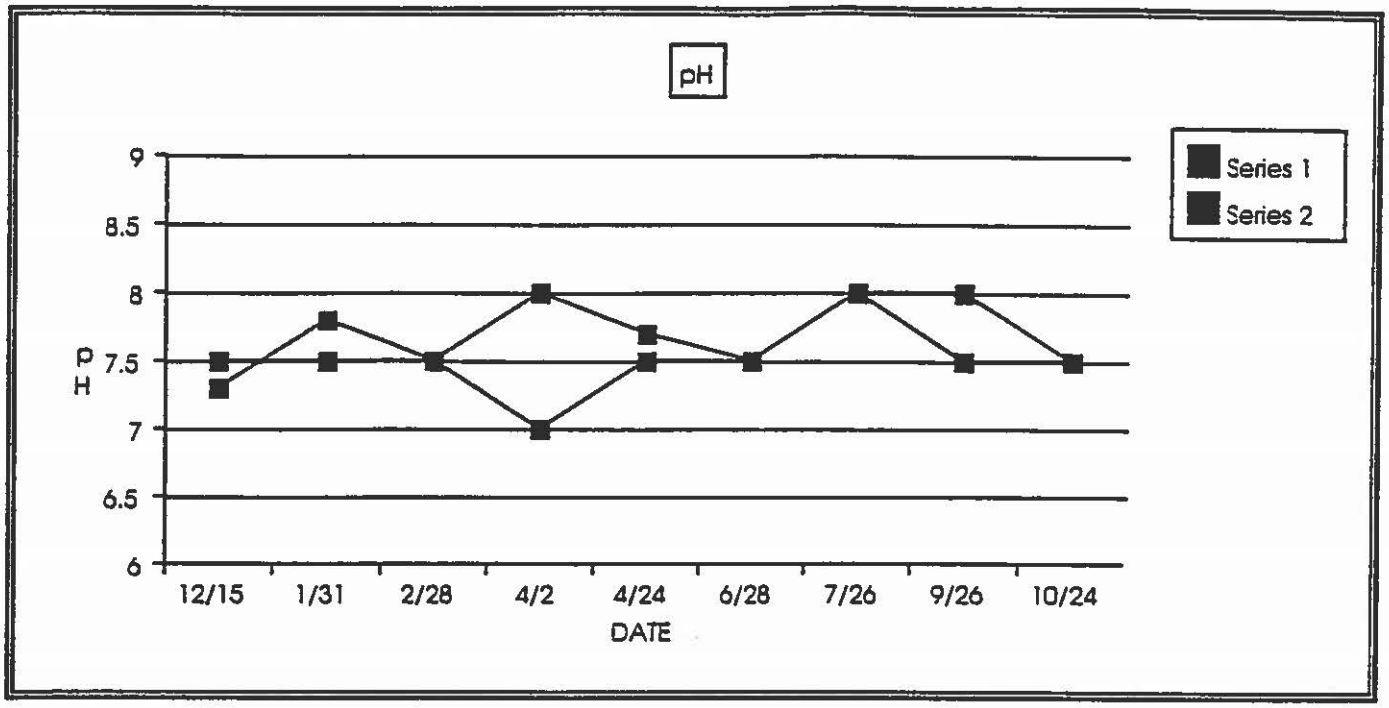
MILL CREEK WATER QUALITY DATA
COLLECTED BY LOS MOLINOS HIGH SCHOOL STUDENTS

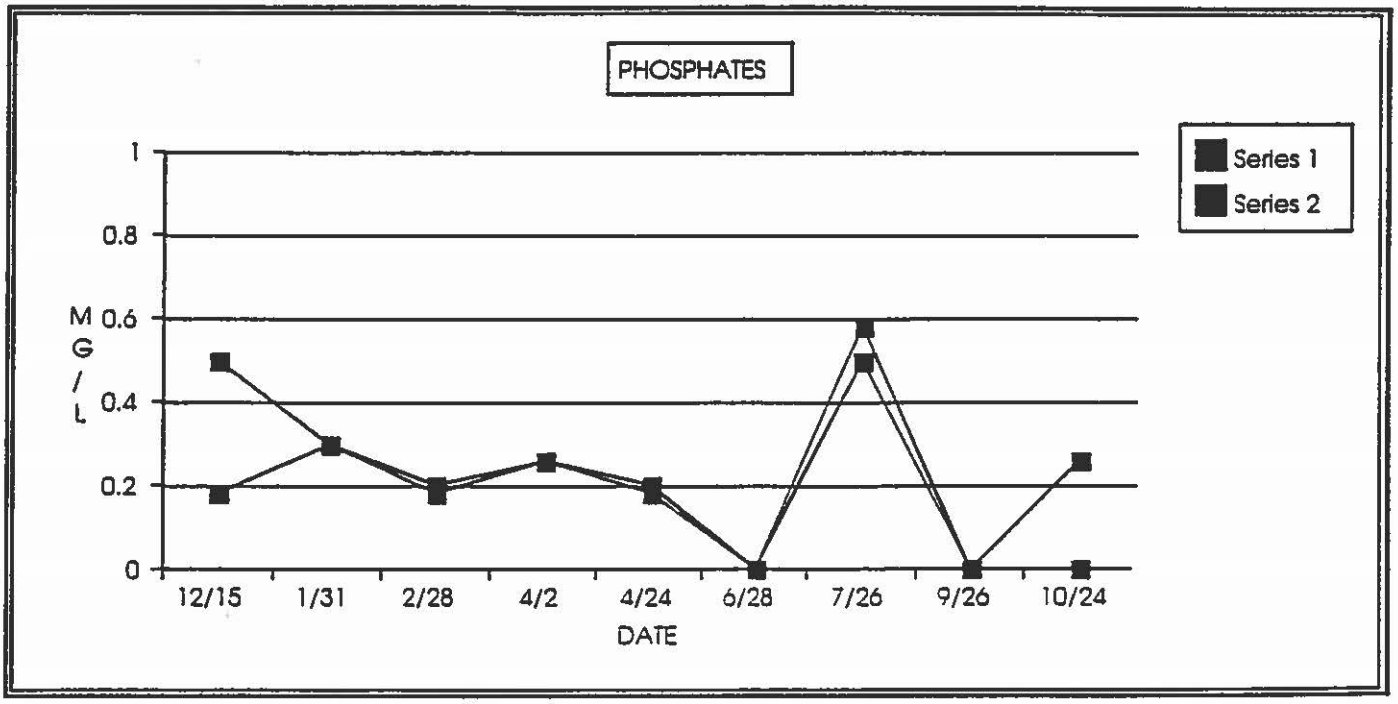


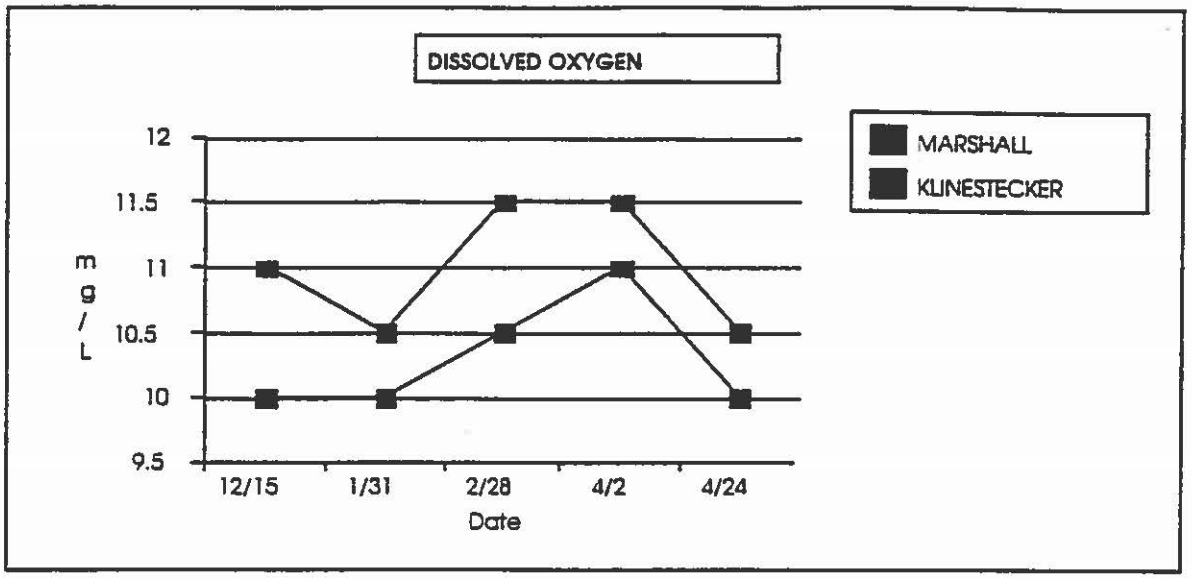


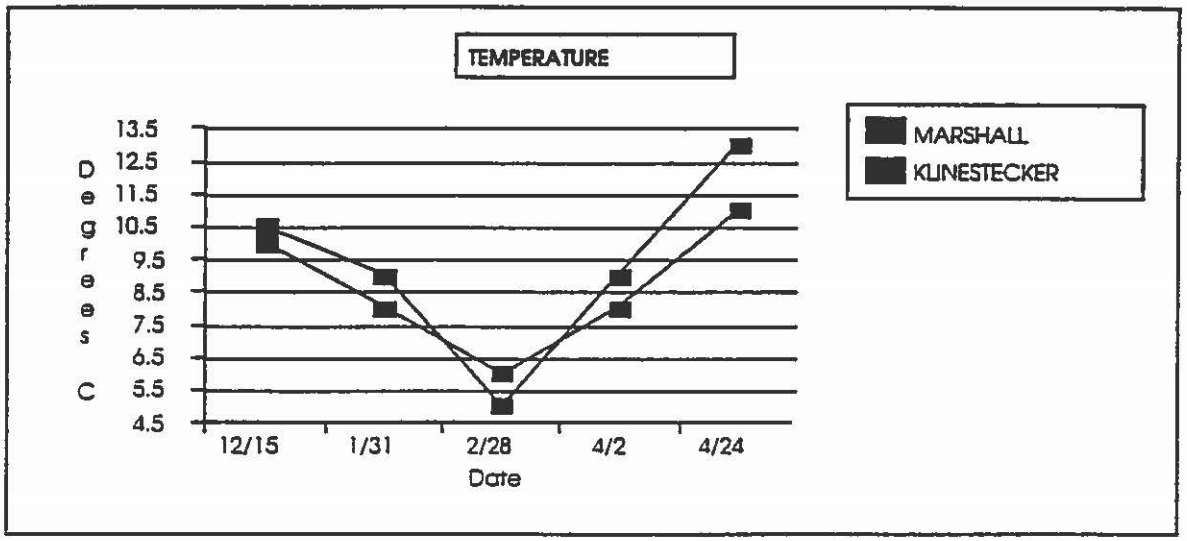

DISSOLVED SOLIDS
100
90
80
70
60
50
40
30
P
P
M
1/31
2/28
4/2
4/24
6/28
7/26
9/26
10/24
DATE
Series 1
Series 2

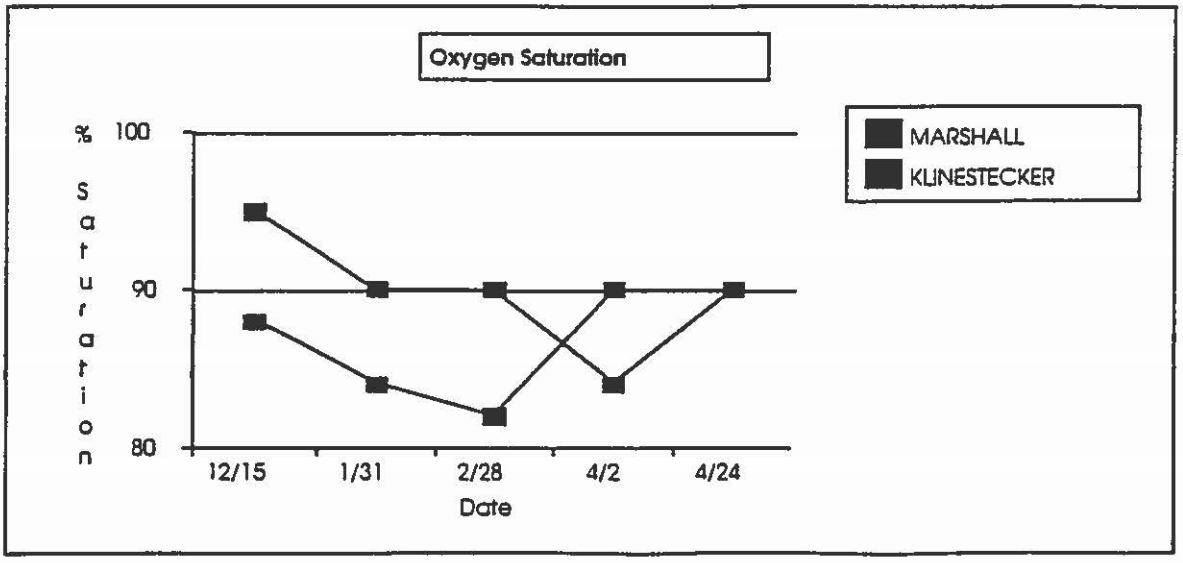

TURBIDITY
60
50
40
30
20
10
0
N
T
U
12/15
1/31
2/28
4/2
4/24
6/28
7/26
9/26
10/24
DATE
Series 1
Series 2

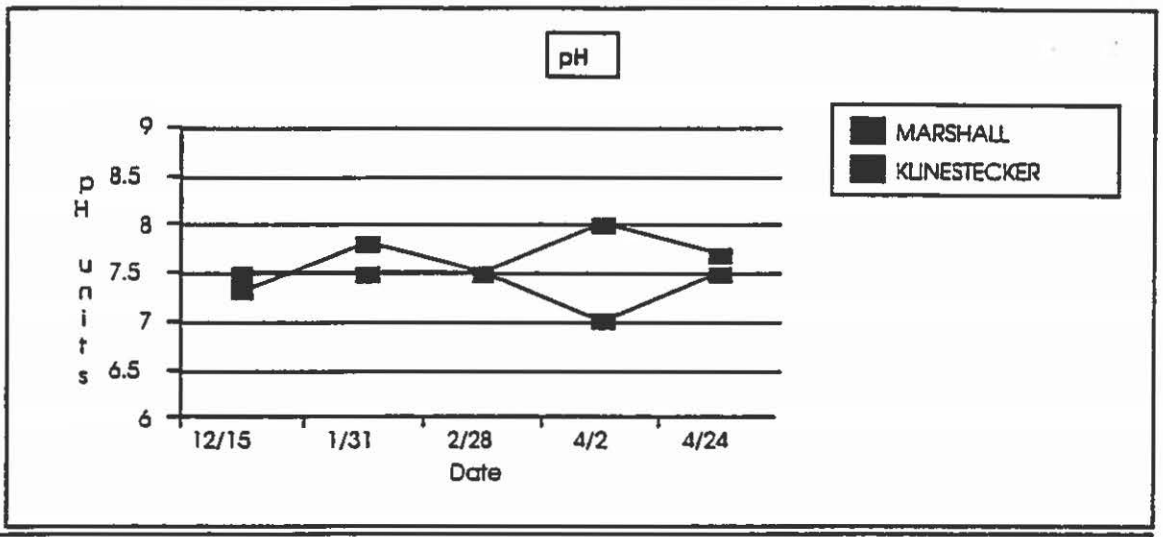

pH
9
8.5
8
7.5
7
6.5
6
PH
12/15
1/31
2/28
4/2
4/24
6/28
7/26
9/26
10/24
DATE
Series 1
Series 2

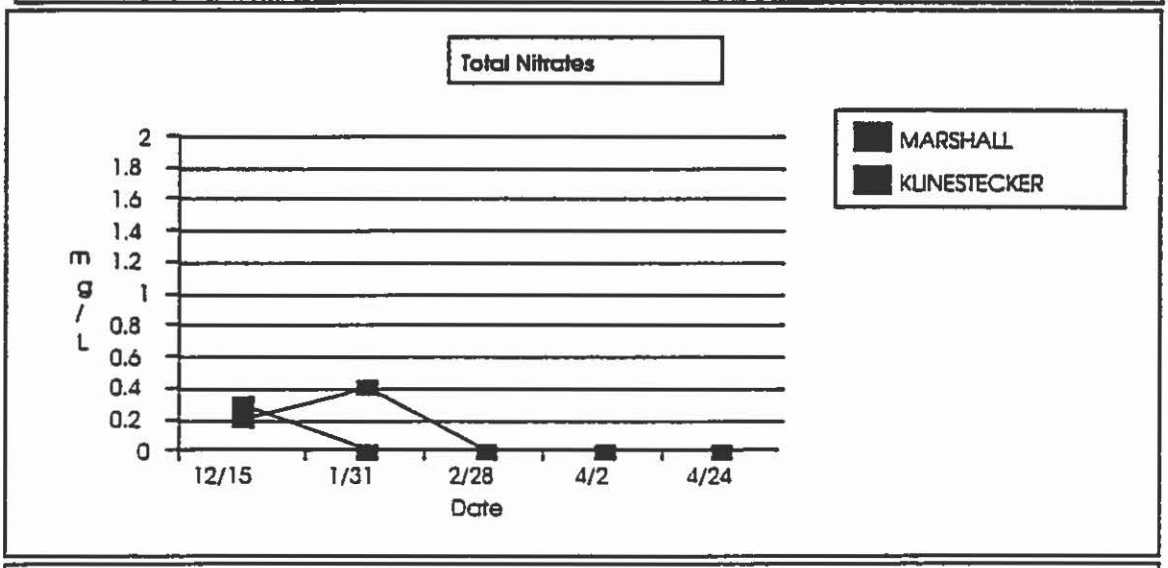

PHOSPHATES
1
0.8
0.6
0.4
0.2
0
MG/L
12/15
1/31
2/28
4/2
4/24
6/28
7/26
9/26
10/24
DATE
Series 1
Series 2

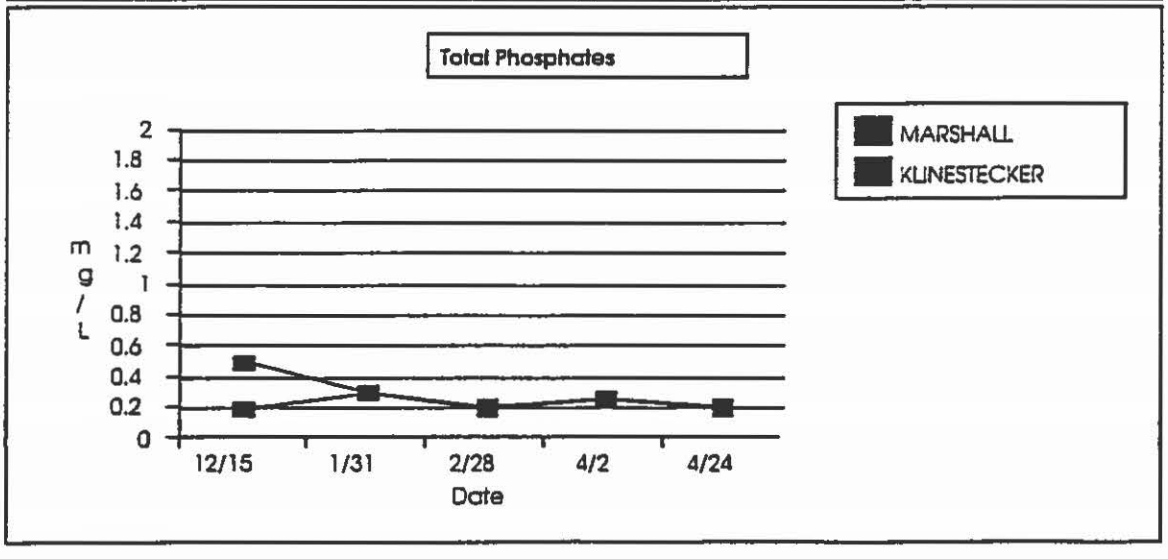

DISSOLVED OXYGEN
12
11.5
11
10.5
10
9.5
mg/L
12/15
1/31
2/28
4/2
4/24
Date
MARSHALL
KLINESTECKER

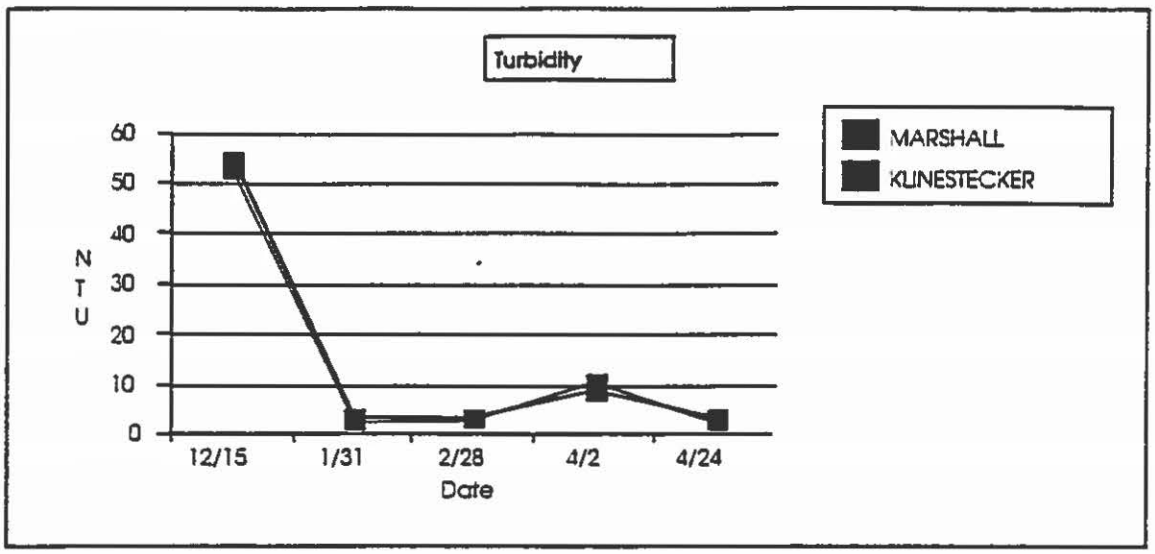

TEMPERATURE
13.5
12.5
11.5
10.5
9.5
8.5
7.5
6.5
5.5
4.5
Degrees C
12/15
1/31
2/28
4/2
4/24
Date
MARSHALL
KLINESTECKER

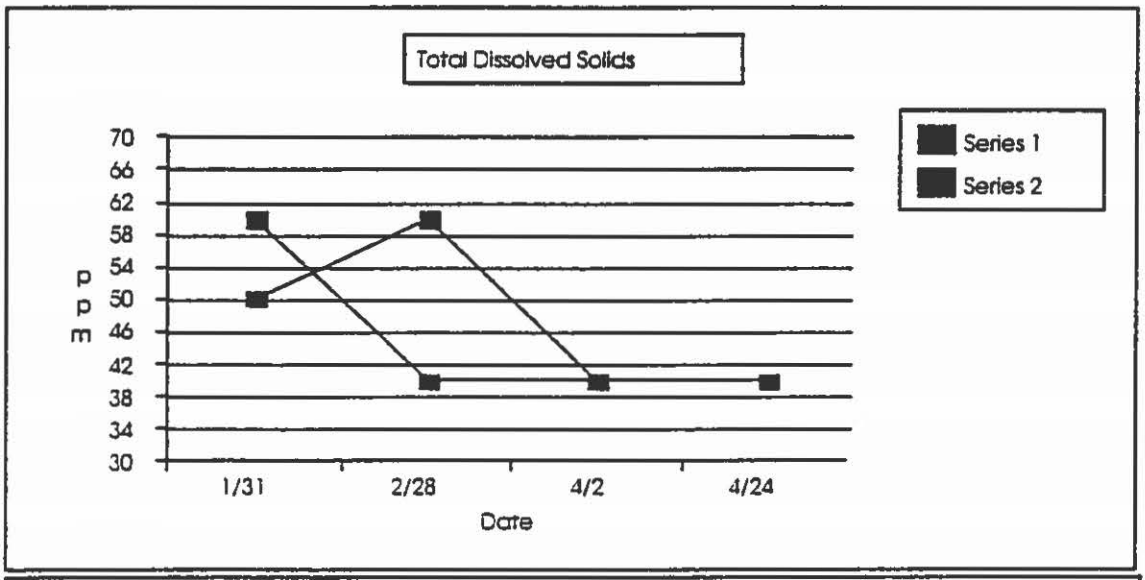

Oxygen Saturation
100
90
80
% Saturation
12/15
1/31
2/28
4/2
4/24
Date
MARSHALL
KLINESTECKER

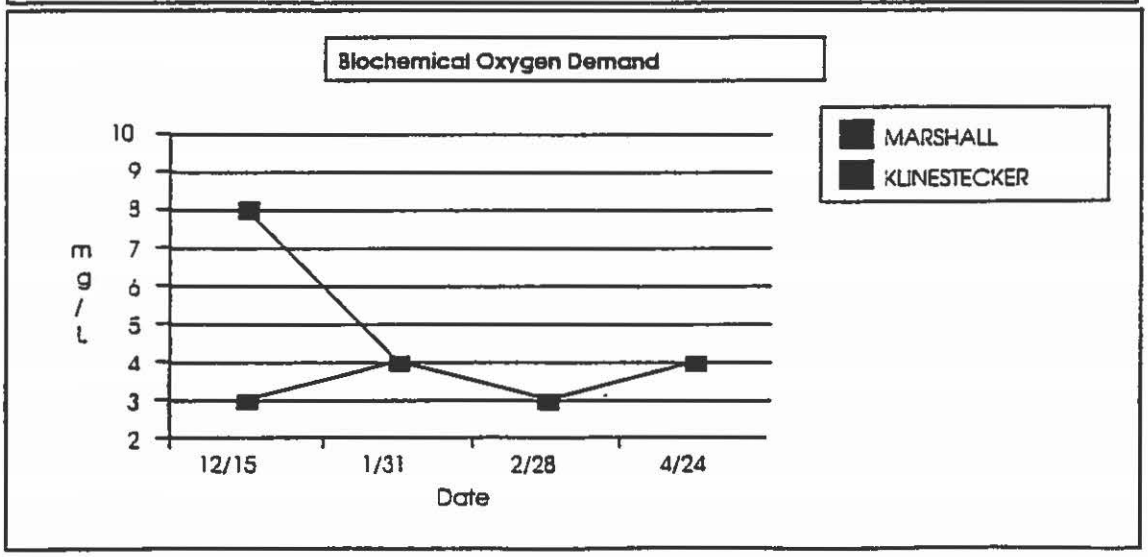

pH
pH units
9
8.5
8
7.5
7
6.5
6
12/15
1/31
2/28
4/2
4/24
Date
MARSHALL
KLINESTECKER


Total Nitrates
mg/L
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
12/15
1/31
2/28
4/2
4/24
Date
MARSHALL
KLINESTECKER


Total Phosphates
mg/L
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
12/15
1/31
2/28
4/2
4/24
Date
MARSHALL
KLINESTECKER


Turbidity
60
50
40
30
20
10
0
NTU
12/15
1/31
2/28
4/2
4/24
Date
MARSHALL
KLINESTECKER


Total Dissolved Solids
70
66
62
58
54
50
46
42
38
34
30
ppm
1/31
2/28
4/2
4/24
Date
Series 1
Series 2


Biochemical Oxygen Demand
10
9
8
7
6
5
4
3
2
mg/L
12/15
1/31
2/28
4/24
Date
MARSHALL
KLINESTECKER

6.4.C California Department of Fish and Game

6.4.C.1 Juvenile Spring-Run Monitoring Program

The juvenile spring-run monitoring program is most easily explained by separating it into two studies: the emergence and rearing studies in the headwaters of Mill Creek, and the outmigrant studies in the valley floor section of Mill Creek.

The purpose of the emergence and rearing studies is to determine when fry are emerging from the gravels and the relative growth rate and size of spring-run fry and yearlings. Beginning in December, CDFG samples are taken at Black Rock (and Hole In the Ground if it is accessible) weekly to determine if fry have hatched. This sampling continues through the end of September. The techniques used to capture fry include electroshocking, which is effective in capturing fry rearing in the edgewater type habitat, and beach seining, which captures the fingerlings rearing in riffle areas. Both techniques are nonintrusive, which means the sampling methods do not kill the salmon. Concurrent with these growth studies, there are DNA analysis and coded-wire-tagging juvenile salmon with a tag that is embedded with a code unique for Mill Creek. The desired outcome of the DNA studies is to determine a measurable genetic differences between spring-run and fall-, winter, and late-fall-runs of chinook salmon. The purpose of the coded-wire tagging is to monitor the movement and occurrence of outmigrating spring-run chinook salmon through the Sacramento River and the Sacramento-San Joaquin Delta and to aid in determining ocean harvest, spawning escapement, and to develop information on returns to natal streams.

The purpose of the outmigration studies in Mill Creek is to monitor when spring-run salmon fry and yearlings are leaving the creek. This outmigration is determined by using a rotary screw trap designed to capture fish moving downstream. This 5-foot-diameter trap is located at the upper diversion on Mill Creek and operates from October through June. The fish captured in this trap provide information such as timing of outmigration and size. Because this trap cannot effectively operate during high flow events, when salmon are emigrating en masse, the small numbers of salmon captured in the trap cannot be expanded for a production estimate. Because this trap is located in fall-run salmon spawning habitat, CDFG cannot identify fry caught in the spring as being spring-run or fall-run. Yearlings trapped in the fall of the year are spring-run, and CDFG will be coded-wire-tagging beginning in fall 1996.

A "real time" monitoring component that will include the Mill Creek juvenile trapping effort was been recently incorporated into the refinements of the Bay Delta Accord. The Mill Creek, Deer Creek and Butte Creek fall sampling data gathered by the Department of Fish and Game will be utilized to establish guidelines and windows for additional refinements for the original Bay Delta Accord diversion flows to account for impacts to spring run chinook salmon juveniles.

6.4.C.2 Adult Spring-Run Monitoring

Adult spring-run chinook salmon begin migrating into Mill Creek as early as March and continue through early July. The peak of migration is typically the end of May. Counts of adult salmon entering Mill Creek are made by counting salmon passing Clough Diversion. An electronic fish counter is installed in the fish ladder at Clough Diversion in late March and remains in place through June. The fish counter is calibrated using a counting tunnel

simulator to detect a conductivity imbalance of 5 percent or greater. It is then checked for upstream and downstream accuracy by passing an 18-inch grilse (precocious 2-year male) carcass through the tunnel. Counts are recorded daily during peak run times. If water clarity allows, an observer is stationed at Clough Diversion at least 2 days a week to count adult and grilse salmon passing through the tunnel to get an adult to grilse ratio. The ladder counts are important in determining run timing and assessing the in-stream flow needs of migrating salmon. During periods of low flow, arrangements are made with the LMMWC for flow releases. Another method of counting adult salmon is by conducting a snorkel survey of the holding habitat of adult salmon, this method is not generally used in Mill Creek because to the natural turbidity of the water.

Because of the clear conditions of Mill Creek this year, a snorkel survey to count adult spring run salmon was conducted between August 21 to September 6. The area surveyed included various stretches from Little Mill at approximately 1,000 feet elevation, upstream to Little Hole in the Ground at approximately 4,500 feet elevation. The total area survey consisted of approximately 16 miles of spring-run chinook salmon holding habitat. The survey was made by divers from CDFG, Humboldt State University, Lassen National Forest, and a private landowner volunteer. The total number of adult spring-run chinook salmon observed was 69. A thunderstorm on September 6, 1996, increased the turbidity thereby making additional salmon observation difficult. Coordinated efforts for comprehensive surveys in the future will be attempted, water visibility permitting.

6.4.D Timber Companies

At the present time, Collins Pine is not conducting any water monitoring programs in the Mill Creek Watershed. Because resources are limited, Collins Pine water monitoring efforts are being focused on the areas subject to ground disturbance activities, Deer Creek, Gurnsey Creek, Butte Creek, and Wolf Creek drainages where Collins Pine is the primary landowner.

Starting in 1996, SPI will be using water temperature data collected by its staff, the CDFG or the USFS to determine the range of variability of temperatures in Mill Creek. This is part of an ownership-wide monitoring plan to better understand potentially limiting factors by more closely examining streams with high and low fish populations in watersheds where SPI owns timberlands.

SPI is working cooperatively with other agencies to avoid duplicating the efforts of gathering temperature information. The data collected will be used independently by each.

6.4.E Department of Water Resources/U.S. Geological Survey

The Northern District Office of DWR has a monitoring station at Highway 99 on Mill Creek. Nutrients (nitrate plus nitrite, ammonia, dissolved orthophosphate, and total phosphorus), minerals (calcium, magnesium, sodium, potassium, sulfate, chloride, and boron), and minor elements (arsenic, cadmium, chromium, chromium, copper, iron, lead, manganese, mercury, selenium, and zinc) are collected from this site in January, May, and September. Every other month samples are collected for alkalinity, turbidity, conductivity, pH, and dissolved oxygen. Benthic macroinvertebrates samples are collected each September. Additional monitoring is conducted in association with the Mill Creek water exchange program.

DWR Northern District has received funding through CVPIA to install and/or enhance three stream flow gauges on Mill Creek. The current USGS gauge at the canyon mouth will be upgraded to monitor temperature and turbidity in addition to flow. It will be connected to the California Data Exchange Center (CDEC) to allow real time monitoring. The newly installed gauge at Highway 99 will be upgraded to include both flow and temperature, and will have real-time access through local telephone lines. Both gauges with upgrades should be operational by June 30, 1997. Additionally, a third gauge will be reestablished at Highway 36, and will include flow, temperature, turbidity, and will have (CDEC) access. The Highway 36 gauge will be installed by June 30, 1998.

6.4.F Sacramento River Toxic Pollutant Control Program

The long-term objectives of the EPA Sacramento River Toxic Pollutant Control Program are consistent with Section 104(a)(1) of the Clean Water Act. The objectives are to identify the causes, effects, and extent of pollution within the Sacramento River basin, and to formulate an implementable program to prevent, reduce, and eliminate pollution.

The specific objectives of this project include:

- Compile and analyze existing information on the sources, effects, extent, and control of toxic pollutants within the basin
- Develop and initiate a basinwide monitoring program that, in conduction with existing monitoring programs, will identify the cause and extent of toxic pollutants within the basin
- Conduct toxicity monitoring that will identify the source and extent of the ambient toxicity which has been observed in basin waters and, in addition, provide information which will be helpful in the development of the basinwide monitoring program.

Mill Creek Watershed is a part of the Sacramento River basin and is included in the project area. Additional information regarding the status of Mill Creek water quality should be available by 1998.