CHAPTER 1. INTRODUCTION

Key Points

- This document is the Staff Report that supports and explains the Scott River TMDL Action Plan. The Scott River TMDL Action Plan is proposed as an amendment to the Basin Plan.
- Section 303(d) of the Clean Water Act requires states to compile a list of impaired water bodies that do not meet water quality standards. The Clean Water Act also requires states to establish total maximum daily loads (TMDLs) for such waters.
- The Scott River is listed under Section 303(d) as impaired by elevated sediment levels and elevated water temperatures.
- The goal of the Scott River TMDL Action Plan is to achieve the TMDLs, achieve sediment and temperature water quality standards, and protect the beneficial uses of water in the Scott River watershed.
- Throughout the Scott River watershed, many individuals, groups, and agencies have been working to restore and enhance fish habitat and water quality. Joint projects of the Siskiyou County Resource Conservation District and the Scott River Watershed Council alone have implemented 132 restoration projects. A total of $9.3 million have been received from a variety of mostly public funding sources to implement these projects between 1992 and March 2005.
- The Scott River watershed is a unique place, characterized by its geography, population, climate, topography, vegetation, hydrology, geology, history, and land use.

1.1 DOCUMENT STRUCTURE & CONTENTS

1.1.1 Scott River TMDL Action Plan

The Scott River TMDL is comprised of two distinct parts: the Staff Report and the TMDL Action Plan. This document is the Staff Report that supports and explains the TMDL Action Plan. Specifically, this document contains the following information:

- Background information.
- Justification and rationale for the amendment.
- Source analyses and methodologies.
- TMDLs and supporting technical information.

- Load allocations and supporting technical information.
- Implementation strategy.
- Monitoring plan.
- Reassessment strategy.
- Economic analysis.
- Alternatives and recommendations of staff of the Regional Water Board.
- Appropriate CEQA documentation.

The full title of the TMDL Action Plan is the *Action Plan for the Scott River Sediment and Temperature Total Maximum Daily Loads*. The Scott River TMDL Action Plan includes the sediment and temperature TMDLs, the strategy to achieve the TMDLs and water quality standards, and draws upon the information presented in the Staff Report. Thus, the support, justification, and technical analysis upon which the Scott River TMDL Action Plan is based can be found in this Staff Report. The Scott River TMDL Action plan is proposed as an amendment to the *Water Quality Control Plan for the North Coast Region* (the Basin Plan) for adoption by the North Coast Regional Water Quality Control Board (Regional Water Board) and the State Water Resources Control Board (State Water Board).

1.1.2 TMDL Introductory Language

As part of the Basin Plan amendment for the Scott River TMDL Action Plan, Regional Water Board staff also propose to add an introduction of TMDLs to the Basin Plan. The additional amendment language contains an introduction to TMDLs, TMDL Action Plans, and the policies and regulatory tools that are applicable to TMDLs.

The additional amendment language is intended to be inserted into the implementation chapter of the Basin Plan. Specific TMDL action plans, such as the Scott River TMDL Action Plan, will then follow this introductory language and be arranged alphabetically by water body.

The purpose for adding the TMDL introductory language into the Basin Plan is to increase the reader's understanding of TMDLs and TMDL action plans. To that end, the language includes a description of the federal requirements for TMDLs and definitions of TMDLs and TMDL action plans. The policies included in the overview are as follows:

- The *Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options* (the Impaired Waters Policy).
- The *Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (the NPS Policy).
- The *Total Maximum Daily Load Implementation Policy Statement for Sediment-Impaired Receiving Waters in the North Coast Region* (the Sediment TMDL Implementation Policy).

The TMDL introductory language also includes an overview of statewide and regional policies that affect TMDLs and the permitting and enforcement tools that can be used in TMDL implementation.

1.2 RATIONALE

The Scott River Total Maximum Daily Loads (TMDLs) for Sediment and Temperature are being established in accordance with Section 303(d) of the Clean Water Act. The State of California has determined that the water quality standards for the Scott River are exceeded due to excessive sediment and elevated water temperature. In accordance with Section 303(d), the State of California periodically identifies those waters that are not meeting water quality standards. The United States Environmental Protection Agency (USEPA) added the Scott River to California's 303(d) impaired waters list in 1992 due to elevated sediment levels and in 1998 due to elevated water temperatures. The Scott River has continued to be identified as impaired in subsequent listing cycles, the latest in 2002.

Excessive sediment loads and elevated water temperatures in the Scott River and its tributaries have resulted in the impairment of designated beneficial uses of water and the non-attainment of water quality objectives. The primary beneficial uses impaired in the Scott River watershed are recreation uses (i.e., contact and non-contact recreation) and those associated with the cold water salmonid fishery (i.e., commercial and sport fishing; cold freshwater habitat; rare, threatened, and endangered species; migration of aquatic organisms; and spawning, reproduction, and/or early development of fish). The cold water fishery beneficial uses include the migration, spawning, reproduction, and early development of cold water fish such as coho salmon (*Oncorhynchus kisutch*), chinook salmon (*O. tshawytscha*), and steelhead trout (*O. mykiss*). The coho salmon population in this watershed is listed as threatened under the federal Endangered Species Act and the California Endangered Species Act. Agricultural and municipal water supplies and groundwater recharge are also affected by excessive sediment supply.

1.3 PURPOSE AND GOALS

The purpose of the Scott River Sediment and Temperature TMDLs is to estimate the assimilative capacity of the system by identifying the total loads of sediment and thermal inputs that can be delivered to the Scott River and its tributaries without causing exceedence of water quality standards. The TMDLs also allocate the total loads among the sources of sediment and thermal loading in the watershed. Although factors other than excessive sediment and elevated stream temperature in the watershed may be affecting salmonid populations (e.g., ocean rearing conditions), these TMDLs focus on sediment and stream temperature conditions in the watershed, the impairments for which the Scott River is listed under Section 303(d).

The goal of the Scott River TMDL Action Plan is to achieve the TMDLs, achieve sediment- and temperature-related water quality standards, and protect the beneficial uses of water in the Scott River watershed. The TMDL Action Plan applies to the portions of the Scott River watershed governed by California water quality standards. It does not apply to lands under tribal jurisdiction.

1.4 WATERSHED RESTORATION AND ENHANCEMENT EFFORTS

Throughout the Scott River watershed, many individuals, groups, and agencies have been working to enhance and restore fish habitat and water quality. These proactive efforts have given the Scott River watershed an advantage over other impaired watersheds with less active stakeholders. The implementation actions described in this document (Chapter 5) reflect the good work and watershed restoration efforts within the Scott River watershed. The Regional Water Board and staff look forward to the improved water quality conditions that are likely to result from the continued implementation of these public, private, and often voluntary programs.

The following sections describe some of the proactive and beneficial accomplishments of concerned citizens and agencies within the Scott River watershed to address sediment waste discharges and elevated water temperatures.

1.4.1 Siskiyou Resource Conservation District

The Siskiyou Resource Conservation District (SRCD), like other resource conservation districts, is a local unit of government established to carry out natural resource management programs. The SRCD was established in 1949 and seeks funding to implement conservation/restoration projects of willing landowners and provides technical assistance throughout the Scott River watershed, especially to landowners involved with agriculture in the Scott Valley. The restoration and enhancement efforts that the SRCD has been involved with over the years relied on the voluntary participation of private agricultural and timber landowners and grant funding.

1.4.2 Scott River Watershed Council

With fiscal and project management assistance from the SRCD, the Scott River Watershed Council (SRWC) has also been making significant strides in the restoration and management of the Scott River and its tributaries. The SRWC was formerly known as the Scott River Watershed Coordinated Resource Management Planning (CRMP) Committee, which formed in September 1992. The goal of the SRWC is to "Seek coordinated resource management in the Scott River watershed which will produce and maintain a healthy and productive watershed and community" (SRWC, 2004, p. 1-3). The SRWC focuses on the diverse group of landowners and land use activities throughout the Scott River watershed. The community-based nature of the SRWC, their accomplishments to date, their technical knowledge, their established history in the watershed, and the trust they have established with a diverse group of interested individuals and community members make the SRWC an ideal group to help implement sediment and temperature control practices.

In 2004, the SRWC completed the Scott River Watershed Strategic Action Plan, which forms the basis for setting priorities for future projects and management practices. The Strategic Action Plan builds upon the first action plans developed by the CRMP in 1995, which addressed fall flows and fish habitat and populations. Many of the strategic actions identified in their plan will be of direct benefit to water quality in the Scott River watershed and will address sediment waste discharges and elevated water temperatures. See Section 5.1.10 for more information on the Strategic Action Plan.

The SRWC has also developed a monitoring plan, which is included as an appendix in the Strategic Action Plan. The monitoring plan provides definitions, methods, and protocols for various monitoring efforts. Methodologies have been established for the monitoring of fish habitat; fish populations; channel conditions through bank stability surveys and channel typing; water temperature; flow; instream sediment levels through V* measurements, McNeil sampling, pebble counts, and turbidity sampling; macroinvertebrate populations; riparian conditions through photo-point monitoring; and restoration project effectiveness through photo-point monitoring. The SRWC also intends to establish and carry out quality assurance and quality control procedures, establish a monitoring database, analyze data, and report on conditions.

1.4.3 Joint Projects of the Siskiyou Resource Conservation District and the Scott River Watershed Council

Since 1992, the SRCD and the SRWC (formerly the CRMP) together have been involved in developing and implementing many significant and beneficial water quality projects. Between 1992 and March 2005, "a total of 132 projects have been implemented on private lands. A total of $9.3 million dollars have been received from various funding sources and invested into the Scott River Watershed to implement these projects" (SRCD, 2005a, p.1). As listed in the Strategic Action Plan (SRWC, 2004) and documentation provided by the SRCD (SRCD, 2005a; SRCD, 2005b), some of these projects include:

- Riparian fencing, riparian planting, bank stabilization, habitat improvement, and stockwater systems installation projects. As a result of many of these projects, riparian exclusionary fencing is in place along ninety-five percent of the mainstem Scott River (cattle are not present in the remaining five percent) and along forty percent of the tributaries. Approximately 200 acres of riparian zone has been planted with pine, cottonwood, and willow. There are several projects, including the following:
    - Scott River Riparian Restoration Analysis,
    - French Creek Riparian Protection and Enhancement Project,
    - Patterson Creek Enhancement Project,
    - Lower Kidder Creek Enhancement Project,
    - Landowner Riparian Planting and Fencing Project,
    - Shackleford Creek Demonstration Project,
    - Scott River Landowner Riparian Restoration Project,
    - Fowle Maintenance Project,
    - East Fork Scott River Habitat Improvement Project,
    - Shackleford Creek Restoration Project,
    - Fay Lane Restoration Project,
    - Shackleford/Mill Road Corridor Improvement Project,
    - Scott River Corridor Habitat Improvement Project located at Eiler Ranch,
    - Scott River Streambank Protection & Riparian Fencing Project at Tozier Ranch,
    - Scott River Riparian Restoration Project,
    - Scott River Riparian Fencing & Planting Project,
    - Scott River Riparian Woodland Revegetation Project,
    - Scott River Corridor Enhancement Project,

  - Scott River Streambank Protection Project, and
  - Scott River Riparian Zone Inventory and Evaluation (Alvin Lewis Study).

- Instream salmonid habitat improvement projects. As a result of these projects, over 317 instream structures have been installed on private property. There are several projects, including the following:
  - Aquatic Habitat Needs Study Plan,
  - Diversion Improvement Program through the use of wiers,
  - Canyon Creek Spawning Gravel Development Project, and
  - Upper Ruffey Lake Habitat Improvement Project.

- Sediment waste discharge studies and reduction projects. As a result of these projects, over 400 miles of roads have been inventoried, approximately 127 miles of roads have received erosion and sediment control improvements (e.g., outsloping, culvert removal, and rocking), and over nineteen miles of roads have been decommissioned. There are several projects, including the following:
  - Moffett Creek Road Abandonment and Decommissioning Project,
  - Moffett Creek Upland Gross Assessment,
  - Mill Creek Road Erosion Inventory,
  - Etna Road Erosion Inventory,
  - South Fork Road Erosion Reduction Project,
  - Shackleford/Mill Road Erosion Reduction Project, and
  - Shackleford/Mill Road Erosion Inventory.

- Flow studies, flow gauging, flow enhancement, tailwater return, and water conservation projects. There are several projects, including the following:
  - Farmers Ditch Diversion Improvement Project,
  - Shackleford Creek Diversion Improvement Project
  - Scott River and Major Tributaries Instream Flow Analysis,
  - Scott River Water Trust Program,
  - Wolford Slough Groundwater Retention Project,
  - Sugar Creek Flow Enhancement Project,
  - Scott River Monitoring/Gauging Project,
  - Shackleford/Mill Water Quality Improvement Project,
  - Scott River Water Conservation-Irrigation Management Project,
  - Scott River Water Balance Study,
  - Scott River USFS Station Operation for FY 1996,
  - Scott River Flow Enhancement Project, and
  - completion of the *Assessment of Scott River Water Trust Options* by Robert Donlan (2004).

- Education projects that focused on watershed and salmonid protection. There are several projects, including the following:
  - Etna Union High School District Watershed Education Program,
  - UC Davis Workshop,
  - Salmon Education Community Workshop, and

  - Kidder Creek Environmental School Fish Field Study Program.

- Monitoring projects. As a result of these projects, water temperature data has been collected since 1995, macroinvertebrate data has been collected since 1998, and three years of adult coho spawning data have been collected. There are several projects, including the following:
  - Scott River Out-Migrant Trapping Project,
  - Mid-Klamath River Chinook Spawner Escapement Survey,
  - Scott River Coho Spawning Assessment
  - Scott River Adult Coho Spawning Ground Survey,
  - Scott River Juvenile Coho Summer Habitat Utilization Survey,
  - Scott River Monitoring Program,
  - Scott River Temperature Assessment, and
  - Temperature Monitoring Program.
- Fish screening and fish passage projects.
- Spawning surveys and studies of salmonid habitat.
- Development of the Strategic Action Plan.

1.4.4 French Creek Watershed Advisory Group

The French Creek Watershed Advisory Group (WAG) was formed in 1990 at the urging of the State Board of Forestry to address cumulative watershed effects and road-related discharges of sediment waste. The French Creek WAG consists of a diverse group of participants, including the Audubon Society, Siskiyou County, CDFG, California Department of Forestry and Fire Protection, the French Creek Drainage Property Owners' Association, Fruit Grower's Supply Company, the Klamath Ecosystem Restoration Office, the Regional Water Board, the SRCD, the SRWC, Roseburg Resources Company, Sierra Pacific Timber Products, the USFS, and the Natural Resources Conservation Service. The French Creek WAG targeted major road-related sediment sources and monitored the changes in French Creek. The SRWC's Strategic Action Plan describes some of the French Creek WAG's efforts:

> "To reduce the sediment yield in the drainage, the French Creek Watershed Road Management Plan and Monitoring Plan were prepared and adopted by the group in late 1992. Much effort was spent on improving the existing road systems on all ownerships in the watershed during the next few years, such as out-sloping, rocking 34 miles of unsurfaced roads, and correcting drainage problems. Monitoring results – such as the amount of fine sediment in pools – began to show immediate improvement in stream habitat quality and sediment levels lowered to within natural background levels by 1995. In 1996, the French Creek group received the CF Industries / Conservation Fund National Watershed Award for voluntary initiatives due to its documented collaborative success. After the 1997 flood, sediment levels in pools increased somewhat but returned to pre-flood, background levels by 1999 and have been sustained since then" (SRWC, 2004, p. 10-7).

1.4.5 Industrial Timber Companies

Private timber companies within the Scott River watershed have also been actively taking steps to protect water quality. The two largest industrial timberland owners in the watershed are Fruit Grower's Supply Company and Timber Products Corporation. Both of these companies have inventoried sediment waste discharges associated with their roads and taken steps to control these sources. These steps include road upgrades, road outsloping, and moving roads away from near-stream areas.

Fruit Grower's Supply Company is also in the process of developing a habitat conservation plan (HCP) that will be designed to protect endangered and threatened species, including coho salmon. The HCP will address timber harvest activities, roads, hillslope practices, and riparian management practices. This proactive step will improve water quality in the Scott River watershed.

1.4.6 Siskiyou County Department of Public Works & Five Counties Salmon Conservation Program

Siskiyou County's Department of Public Works (DPW) is responsible for the management of county roads and bridges in the Scott River watershed. The DPW is an active participant in the Five Counties Salmonid Conservation Program.

Five counties in northern California – Siskiyou, Del Norte, Humboldt, Trinity, and Mendocino – have joined together in the Five Counties Salmonid Conservation Program(Harris, 2002). The Five Counties program is a joint project of the University of California, Cooperative Extension and the five counties in response to the listing of coho salmon under the federal Endangered Species Act. The Five Counties Salmonid Conservation Program developed *A Water Quality and Stream Habitat Protection Manual for County Road Maintenance in Northwestern California Watersheds* (2002). "The purpose of this manual is to provide a user-friendly, fish-friendly guide for County road maintenance staff as part of each county's primary mission to provide a safe and open road system for the traveling public" (Five Counties Salmonid Conservation Program, 2002, p. vi).

Through the Five Counties Salmon Conservation Program, the Siskiyou County DPW has received training on the manual and sediment control practices designed specifically for county roads. Additionally, Siskiyou County will soon have a road sediment source inventory performed through the Five County program. This inventory will describe the potential of county roads to delivery sediment waste to streams and sets priorities for treatment, using a protocol known as Direct Inventory of Roads and Treatments (DIRT). This program includes an inventory methodology, guidance, and a database for storing and analyzing the data.

1.4.7 CDFG Coho Recovery Process and Incidental Take Permits

As a result of the listing of coho salmon as threatened in the Scott River under the California Endangered Species Act, the California Department of Fish and Game (CDFG) developed a statewide *Recovery Strategy for California Coho Salmon* (Coho Recovery Strategy) that includes

an important section on just the Scott and Shasta rivers. The Coho Recovery Strategy was developed with significant input from stakeholders who live and work in the Scott or Shasta watersheds.

The Coho Recovery Strategy includes implementation actions and recommendations for the recovery of coho salmon. Several of the actions that are relevant to the sediment and temperature water quality impairments in the Scott River watershed are listed in Table 5.5 and discussed in Section 5.1.12.3. For example, there are actions and recommendations relating to riparian vegetation, sediment inputs, roads, water use, groundwater, and the dredge tailings.

The California Endangered Species Act also prohibits the take of a threatened species without authorization, which is known as an Incidental Take Permit. CDFG and the SRCD are currently working on a watershed-wide permitting approach. Under the Watershed-wide Incidental Take Permit, the SRCD will be the permit holder allowing individual landowners in the watershed (primarily those involved with agricultural water diversion and/or livestock management activities) to enroll as sub-permittees in the program and work directly with the SRCD. The sub-permittees would avoid a CDFG fee and be protected from enforcement action under the Endangered Species Act. Salmonid research and restoration projects also fall under the scope of the Watershed-wide Incidental Take Permit. See Section 5.1.12.4 for more information on the Incidental Take Permit.

1.4.8 Department of Water Resources

The California Department of Water Resources (DWR) assists local water districts in water management and conservation activities and plans for future statewide water needs. In the Scott River watershed, the DWR has been involved with the installation of stream gages, rescues of stranded salmonids, and the development of the Coho Recovery Strategy. The DWR has also increased coordination efforts with other agencies involved in water management issues in the Scott River watershed.

1.4.9 United States Forest Service

Efforts by the United States Forest Service (USFS) to enhance and restore water quality in the Scott River watershed have included both planning and on-the-ground implementation projects. In regards to planning efforts, the USFS has developed two ecosystem analyses for the Scott River watershed: the Callahan Ecosystem Analysis in 1997 and the Lower Scott Ecosystem Analysis in 2000. The purpose of the analyses is to provide a means by which the watershed can be understood as an ecological system and to develop and document an understanding of the processes and interactions occurring within the ecosystem (USFS, 1997). The analyses also include the management opportunities that will provide background for management decisions in the future.

In regards to on-the-ground sediment and temperature control projects, the USFS, Klamath National Forest is currently working on several watershed restoration projects. The Lower Scott River Roads Analysis Process (RAP) is designed to reduce impacts to riparian areas and stream systems within the lower Scott River watershed. Specifically, the RAP will protect and improve

water quality while providing a transportation system that is safe, affordable, efficient to manage, and environmentally sound. The RAP will include road storm-proofing, road maintenance, road upgrades, road decommissioning, and the creation of new roads. The Klamath National Forest is also working on a Fish Passage Project that will modify road stream crossings to allow for fish passage.

Additionally, the USFS has been a participant in the SRWC and the French Creek WAG, and has cooperated on many of the restoration and enhancement projects undertaken by those groups.

1.4.10 Klamath River Basin Fisheries Task Force

The Klamath Act (Public Law 99-552) provides for a sixteen member Klamath River Basin Fisheries Task Force, which was organized and chartered as a federal advisory committee in 1987. The Task Force includes members that "are appointed by and represent the Governors of California and Oregon; the U.S. Secretaries of Interior, Commerce and Agriculture; the California counties of Del Norte, Humboldt, Siskiyou and Trinity; Klamath County, Oregon; the Hoopa Valley, Karuk, Yurok and Klamath native tribal fishers; anglers and commercial fisherman" (Kier Associates, 1999, p. 5).

The Task Force has worked toward restoring Klamath River fisheries, primarily salmon and steelhead, by "funding watershed restoration planning and education, fisheries research and monitoring, fish stock enhancement, and on-the-ground habitat restoration" (USFWS, 2005). Between 1987 and 1998, the Task Force has helped to remediate problems related to agricultural activities in the Scott River watershed with cattle exclusion fences, riparian re-vegetation, bank stabilization, and innovative stock water systems (Kier Associates, 1999, Appendix 5).

1.5 SCOTT RIVER WATERSHED CHARACTERISTICS

1.5.1 Area and Location

The Scott River drains a 520,184-acre (813 mi^2) watershed in the Klamath Mountains in Siskiyou County in northern California, flowing generally northward into the Klamath River (Figure 1.1). The watershed shares divides with the Shasta River to the east, the Trinity River to the south, and the Salmon River to the west.

1.5.2 Population

The total resident population in the Scott River watershed in the 2000 census was estimated at approximately 8,000 (SRWC, 2004). Four "post office towns" lie in the watershed: from north to south, these towns are Fort Jones (pop. 670), Greenview (pop. 175), Etna (pop. 790), and Callahan (pop. 200) (SRWC, 2004; NationMaster.com, 2005).

1.5.3 Climate and Hydrology

The Scott River watershed has the typical hot, dry summers and cool, wet winters characteristic of Mediterranean climates. However, because the latitude of the area (between 41° N and 42° N) is at the northern extreme of the Mediterranean climate zone, and the watershed lies in a mountainous region, the watershed has colder winters than the average Mediterranean region. The Scott River watershed mainly falls within the Mediterranean highland climate region with much of the winter precipitation falling as snow.

The Scott River hydrology depends largely on precipitation stored as snow at higher elevations in the mountains to the west and south of Scott Valley, where annual precipitation is in the 60-80 inch range. Streams leaving the mountains emerge into the valley and recharge the high capacity aquifer of sand and gravel that underlies the valley. Many of the streams entering the valley from the west form alluvial fans where they enter the valley. These alluvial fans are areas where groundwater recharge occurs, and the streams often go completely dry as water percolates into the permeable gravels and cobbles.

The Scott Valley aquifer is analogous to a container that stores water. Each year the container fills during the wet periods and empties during the dry period. The amount of water passing back and forth between the stream and the aquifer is proportional to the difference in elevation of the stream water surface and the water table, and limited by the permeability of the sediments the water must pass through.

During the winter and spring the aquifer is recharged by the river and percolated precipitation (Figure 1.2 A). Once the flow has subsided, the river changes to a gaining stream (Figure 1.2 B) as stored groundwater re-enters the stream channel. In drier years, winter and spring flows are not sufficient to fully recharge the Scott Valley aquifer, the water table falls below the elevation of the river bottom (Figure 1.2 C), and the river runs dry.

In the mountains of the east side of the watershed precipitation is 12-15 inches. The eastern area is much drier because it lies in the rain shadow of the mountains to the south and west. Many of the eastside streams are ephemeral for most of their length, flowing only during precipitation events. However, the headwater reaches of many of the streams flow perennially.

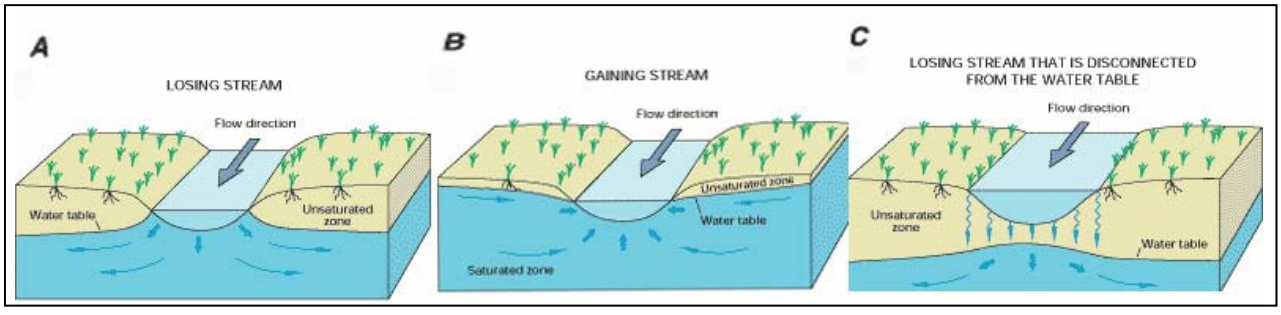

Figure 1.2. Conceptual illustrations of the interaction of ground water and surface water. (From Winter et al., 1998.)

The annual precipitation recorded at Fort Jones from 1935 to 2004 is presented in Figure 1.3. Average temperatures in the valley bottom range from 33°F in winter to 70°F in summer. Recorded temperature extremes range from a high of 110°F to a low of –23°F.

The hydrologic conditions of the Scott River watershed vary widely from year to year, as indicated in Figure 1.3. The watershed experiences both floods and droughts regularly. The largest floods occur when relatively warm storm systems melt a pre-existing snow pack. The Scott River watershed is susceptible to these rain-on-snow events due to the topographic characteristics of the basin. A significant portion of the basin is between 4,500 and 5,500 feet in elevation, which is the range of elevation most susceptible to rain-on-snow. The largest floods of record (1861, 1955, 1964, 1974, and 1997) were associated with rain-on-snow events (USFS, 2000b). Drought years have occurred in 1944, 1955, 1977, 1990, 1991, 1992, 1994, 2001, and 2002. The record of annual peak flows of the Scott River near Fort Jones is presented in Figure 1.4. The record of annual minimum flows of the Scott River near Fort Jones is presented in Figure 1.5.

Despite the year-to-year variability of the Scott River hydrology, the river exhibits trends that are consistent in all but the most extreme water years. The U.S. Forest Service summarized these trends as follows:

> "Water discharge levels typically rise in November to late December in response to fall rains; peak discharge in January and February in response to large winter storms; a slight decrease in late March or early April as storms decrease and temperatures remain low; an increase in April to June from snowmelt; and a rapid decrease in discharge in June to August as snowmelt diminishes and storms have ceased. It is also evident that in every year, regardless of whether the winter was wet or dry, summer flow levels decrease to very low in August to September. This is in response to a combination of natural and man-made situations: hot days with no precipitation and intensive use of water for agriculture in Scott Valley" (USFS, 2000b).

California Department of Water Resources estimated the consumptive water use in Scott Valley as 59,400 and 65,600 acre-feet in 1998 and 2000, respectively (B. Bennett, personal communication, in Fitzgerald, 2005c). Since 1942, the average flow of the Scott River from April through September is 32, 096 acre-feet, with a total of 192,575 acre-feet passing out of the valley during the same time period, on average (USGS, data retrieved 9/6/2005).

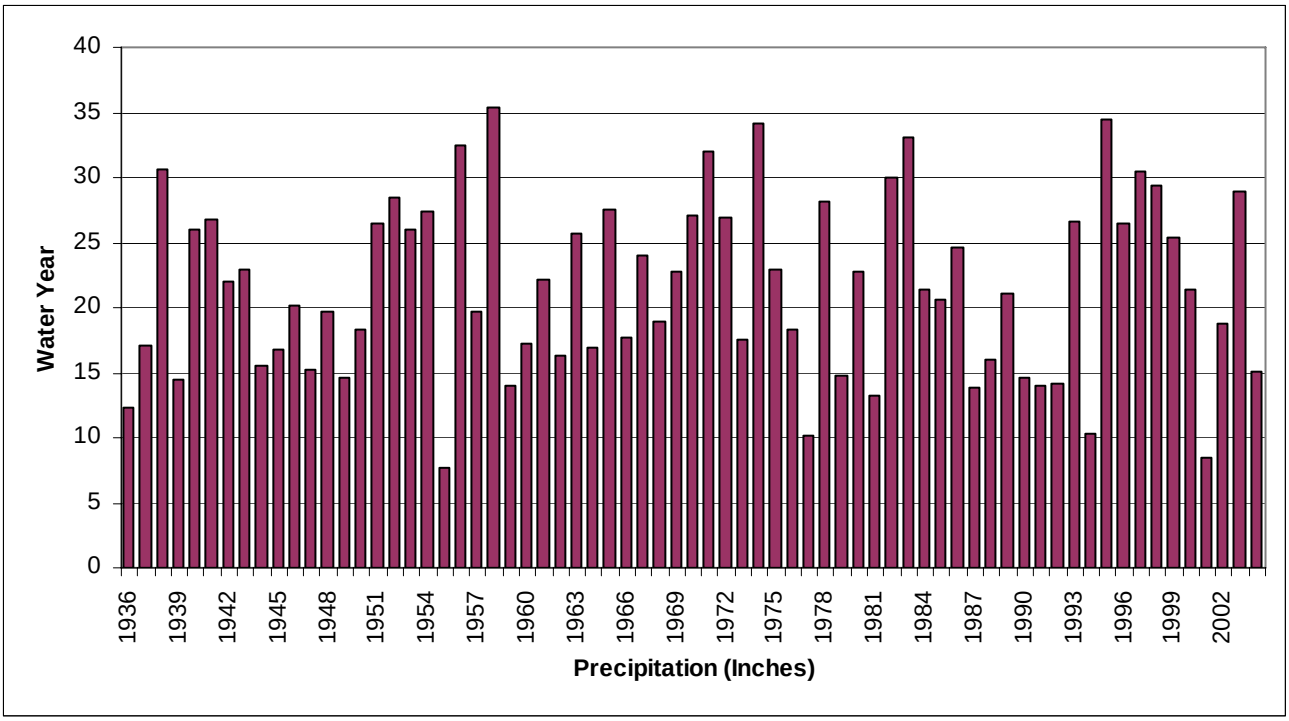

Figure 1.3: Annual precipitation measured at Fort Jones.

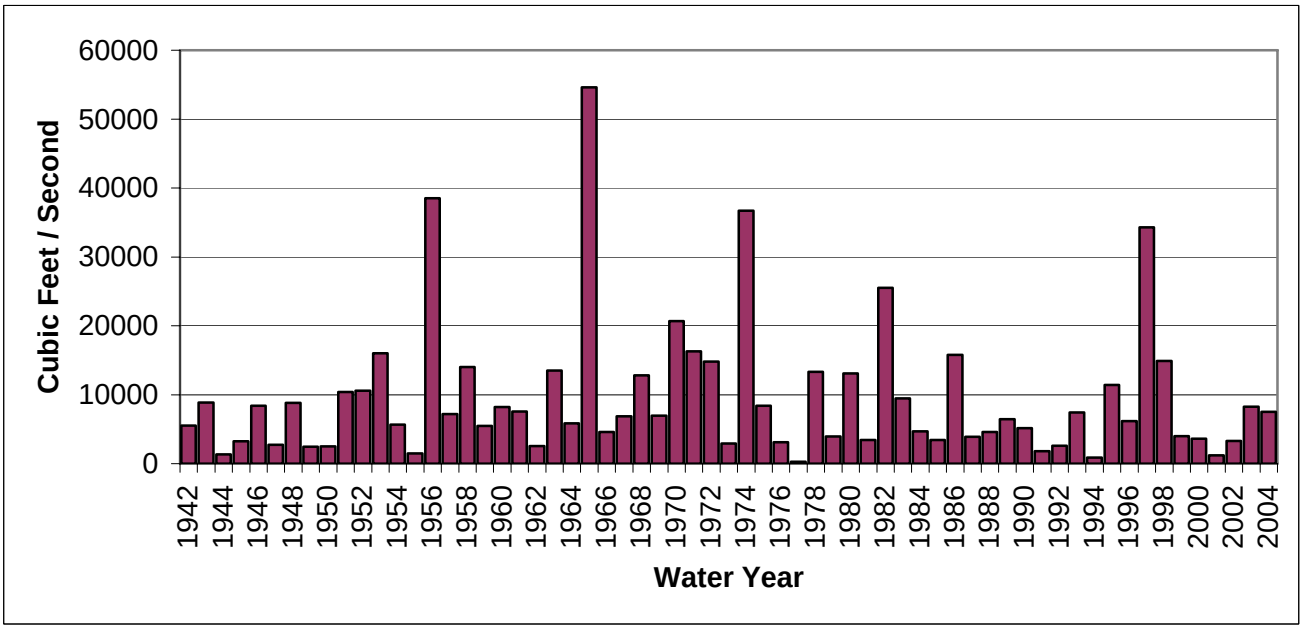

Figure 1.4: Peak flows by water year, Scott River near Fort Jones 1942-2004

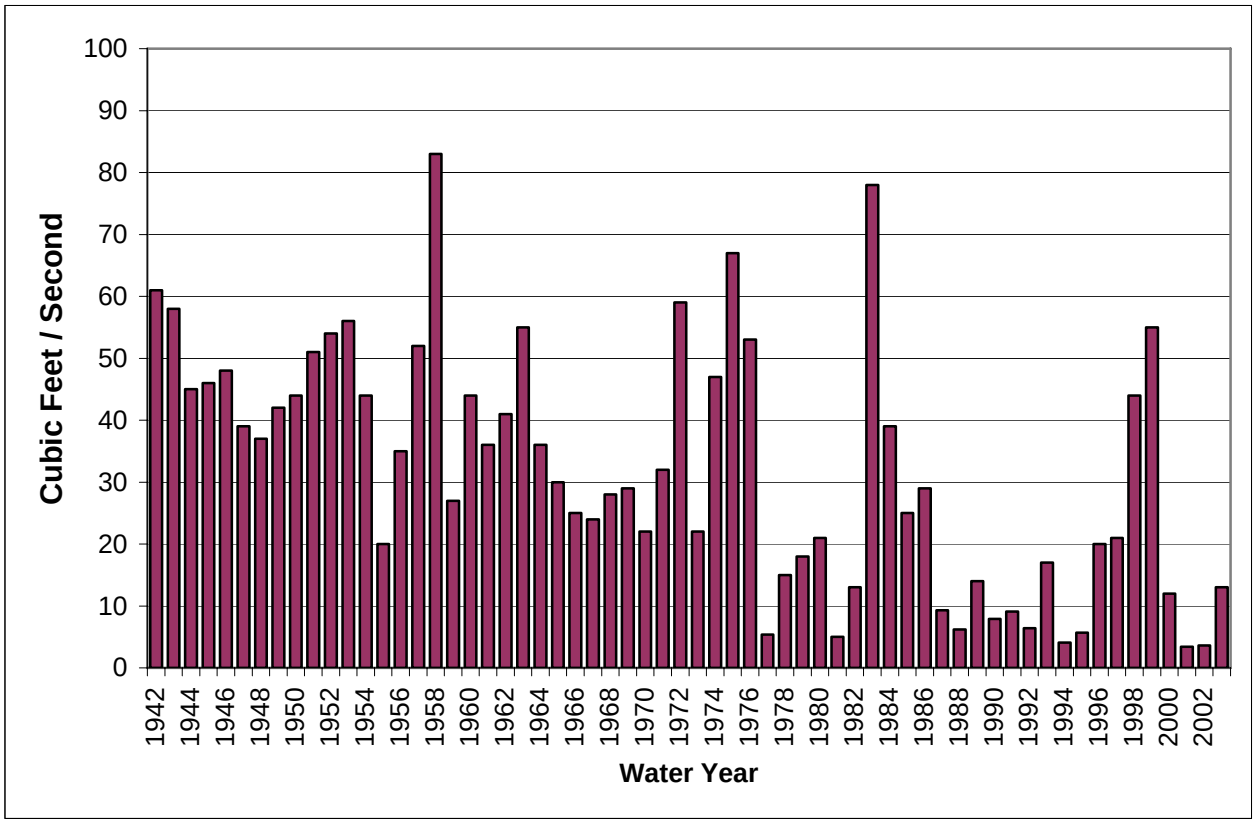

Figure 1.5: Minimum flows by water year, Scott River near Fort Jones 1942-2004

1.5.4 Topography

The watershed consists of two major types of topography. The gently graded floor of Scott Valley, about 75 mi^2, is traversed by some thirty miles of the mainstem Scott River and the lower reaches of tributaries. Surrounding this valley are steep mountains incised by steep-sided valleys carrying rushing streams. Elevations range from above 8,542 feet at China Mountain in the Scott Mountains on the southern boundary of the watershed down to the 2,500-3,200 foot range in the floor of Scott Valley. In the canyon section, downstream of Scott Valley, the Scott River descends to 1,600 feet in elevation where it enters the Klamath River.

The valley of the mainstem Scott River can be divided into two major reaches. The lower Scott River, from River Mile (RM) 0 to RM 21, known as the "canyon section," flows mostly on bedrock and is confined in a steep-sided, rocky canyon at a gradient in the range of 45-55 ft/mi. From RM 21 to about RM 50 – through flat, open, agricultural Scott Valley – is the "valley section" of the river, which flows across the gentle plain of the floor of Scott Valley. Through this section, the gradient is in the range of 4-8 ft/mi.

Table 1.1 Relative Extent of Vegetation Types in the Scott River Watershed (Data from CalVeg online)	
Vegetation Type	**Percent of the Watershed**
Conifer Tree Species	58%
Mixed Conifer and Hardwood Species	15%
Hardwood Species	9%
Agricultural Crops and Grassland	11%
Brush	5%
Other	2%

1.5.5 Vegetation

The vegetation of the Scott River watershed is heterogeneous and is reflective of the climatic variation that occurs in the watershed. Conifer tree species are the most common vegetation in the watershed (Table 1.1), dominating the mountains of the north, west and southern areas of the watershed. The southwestern area of the watershed is known to have the greatest diversity of conifer species in the world. The eastern areas of the watershed reflect the drier climate, with most conifers primarily found on north-facing slopes. However, western Junipers are found scattered throughout the eastern areas of the watershed.

Hardwood tree species, such as oak and madrone, compose a small portion of the vegetation of the watershed and are most common in the northern and eastern areas of the watershed. Grassland and agricultural crops compose just over ten percent of the watershed, and are primarily found in Scott Valley and areas in the East Fork Scott River watershed.

1.5.6 Geology

The Scott River watershed lies in the Klamath Mountains geologic/geomorphic province and is underlain by complex, highly deformed rocks. The bedrock is greatly varied and includes high and medium grade metamorphic rocks, slightly metamorphosed sedimentary rocks and volcanics, granite and diorite, mafic and ultramafic rocks that are largely altered to serpentine, and small amounts of limestone. This complex has been deformed by folding, intense shearing, and thrust faulting. Deformation in the last 1-2 million years has resulted in uplift in the mountains and subsidence of Scott Valley.

Scott Valley has been down-dropped and broken by faulting during late Tertiary and Quaternary time. In consequence, bedrock under the middle part of the valley is several hundred feet below bedrock near the downstream end of the valley. This great depression has been filled by sediments, mostly gravel and sand, that have been washed in and deposited by streams during the subsidence. This basin-fill deposit is a high capacity aquifer that carries the large amount of ground water that allows the abundant irrigation that supports much of the agriculture in Scott Valley.

Rich gold deposits, mostly originating in the mafic and ultramafic rocks and concentrated in stream gravels, were discovered in 1850. Intensive mining of stream and terrace gravels has led to major changes along riparian corridors.

For the purpose of this study two aspects of the geology are salient. First, geologic activity: Recent high rates of uplift have produced steep mountains that shed abundant sediment. Second, composition and structure: The rock units are so numerous and so varied in their characteristics that it is not possible in this study to consider individually all the geologic units that have been identified and mapped. For that reason, we lump the mapped geologic units into a small number of composite units that have similar characteristics relating to sediment contribution. The combining of geologic units is discussed in Section 3.1.

1.5.7 History and Land Use

Information on history and land use is synthesized from the following sources: USDA Forest Service (1997), Scott Valley Chamber of Commerce (2005), and Scott River Watershed CRMP Committee (1995) and SWRC (2004).

The Scott River watershed's longest standing residents are native Americans. The Quartz Valley Indian Community, federally recognized in 1983, includes members of the Shasta, Karuk, and Upper Klamath tribes. Tribal trust lands include the Quartz Valley Indian Reservation.

The hydrology and surface conditions in the Scott River watershed have been affected over time by several intense human activities. From about 1820 into the 1850s, systematic trapping removed a large population of beavers in the watershed. Beaver ponds provided lag time in runoff and sources of infiltration to recharge groundwater.

Rich placer gold deposits beneath the streams and floodplains, and in the gravels of river terraces, led to extensive placer mining beginning in 1850. Riparian areas along the mainstem Scott River, the South Fork, the East Fork, Oro Fino Creek, and many tributaries to the west and south of Scott Valley were greatly disturbed by placer mining. Large areas adjacent to streams were stripped of vegetation and the stream deposits hydraulically or mechanically worked to retrieve gold. These techniques left behind un-vegetated, worked river and terrace deposits, many of which persist today as piles of boulders and cobbles that still lack soil and harbor little vegetation. This type of mining ended about 1950 (USFS, 1997). Water from virtually all tributaries was diverted for use in mining. Much of the resulting ditch system has remained in use, and parts have been expanded as agriculture developed.

Agricultural activities have cleared land and created a large demand for diverted stream water and shallow ground water. Once-dense riparian vegetation has been radically reduced, except in scattered areas with riparian fencing. By the early 20th century, most of the floor of Scott Valley, and tributary valleys that were not too steep, had been cleared and converted to agriculture. There are approximately fifty square miles of irrigated land in the watershed. The quarternary areas consist of approximately eighty square miles, most of which is located within the Scott Valley. To protect farmland from bank erosion and reduce flooding, the mainstem Scott River

has been straightened, rip-rap placed through much of the valley, and further constrained by levees along some stretches.

Timber harvest began along with mining, but large-scale timber harvest for export from the area has been ongoing since 1950. The extensive network of roads, skid trails, and landings, along with other associated timber harvest activities, have led to increases in sediment contributions to the stream system. Large areas underlain by decomposed granite soil ("DG" on surficial geologic maps and in local parlance) are particularly prone to chronic raveling when disturbed, and produce large amounts of sand-sized sediment.

Current land-use activities in the watershed include timber harvest on both private and public lands, irrigated agriculture (primarily alfalfa, pasture, and grain), and livestock grazing. Irrigated agricultural lands comprise about 32,000 acres, or 6%, of the watershed area. One or more of these activities have the potential to affect water quality through increased sediment loads to streams, increased solar radiation reaching streams from loss of near-stream shade, water use, and loss of large woody debris in streams.

At present, 10.4% of the Scott River watershed is protected as designated Wilderness, and 1% as Wild and Scenic River.

1.5.8 Land Ownership

Ownership of land in the Scott River watershed is summarized in Figure 1.6.

1.6 ENDANGERED SPECIES ACT CONSULTATION

The USEPA and the Regional Water Board have initiated an informal consultation process with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration, Fisheries (NOAA Fisheries) on Klamath River TMDLs. Regional Water Board and USEPA staff have used this process to provide information and updates on the TMDLs in the Klamath basin, namely the Salmon, Scott, Shasta, Lower Lost, and Klamath River TMDLs. In addition, both NOAA Fisheries and the USFWS have attended the Scott River TMDL Technical Advisory Group meetings.