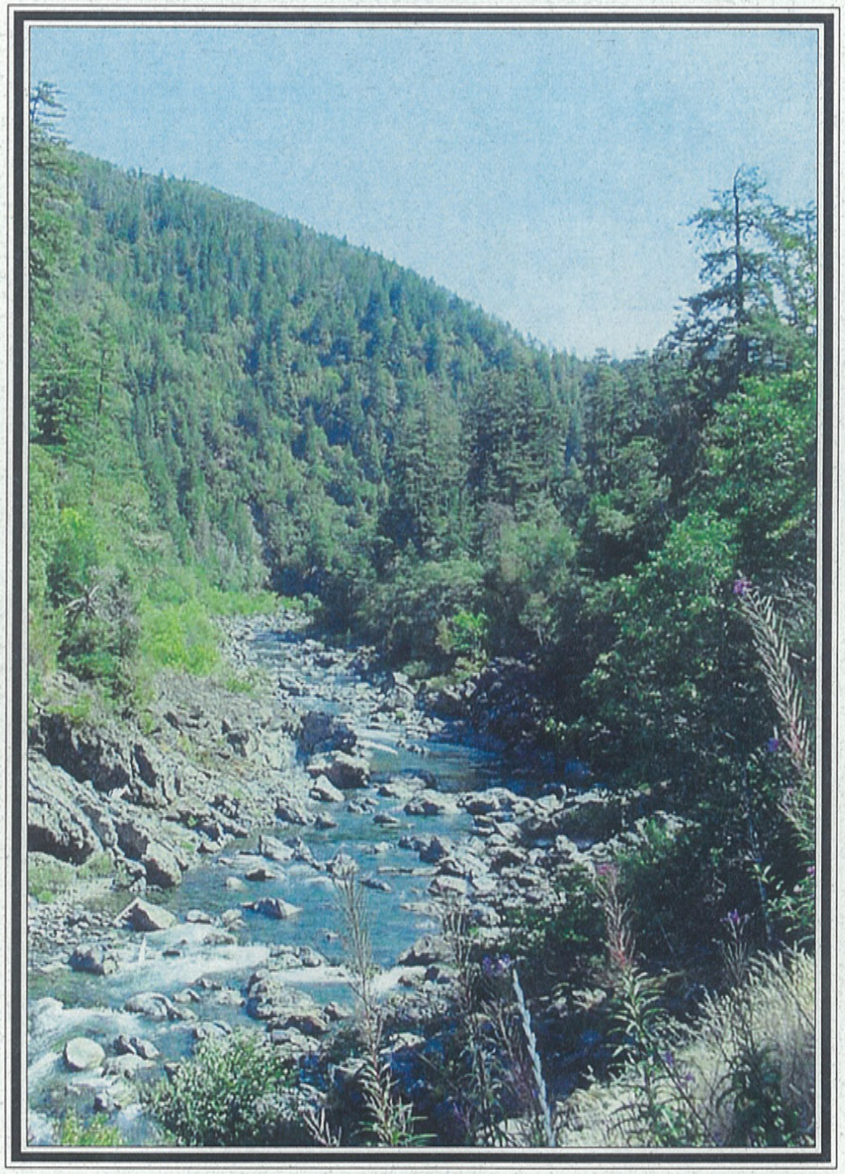
Smith River Anadromous Fish Action Plan



Smith River Advisory Council
March, 2002

Smith River Anadromous Fish Action Plan (SRAFAP)

Version 1.0

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Plan Authors:

Hans Voight, Fisheries Consultant
Action Plan Writer

Jim Waldvogel, SRAC Chairman
University of California Sea Grant Extension Advisor
586 G St
Crescent City CA 95531

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Plate 1. The Mouth of the Smith River, California, August 1994.

ACTION PLAN OVERVIEW

Vision Statement

The purpose of the Smith River Anadromous Fish Action Plan (hereinafter "Action Plan") is to maintain and enhance the abundance and diversity of anadromous fish populations in the Smith River.

Goals for the Action Plan

- Assess past and present watershed conditions in the Smith River Estuary and anadromous fish-bearing tributaries.
- Identify existing "data-gaps" and other data collection efforts that will lead to the identification and understanding of limiting factors affecting Smith River salmonids.
- Formulate specific recommendations for fisheries monitoring, habitat assessment and watershed restoration activities that incorporate established scientific protocols.
- Maintain natural resource economies while minimizing impacts to anadromous fisheries.
- Promote and develop community participation in the management and restoration of natural resources in the Smith River Basin.

Scope of the Action Plan

The Action Plan describes characteristics throughout the entire Smith River watershed, but focuses on the privately owned portion of the basin. General watershed topics such as hydrology, climate, geology, and vegetation/riparian corridors are summarized with references. Management influences, resource users and economic impactS are likewise considered. This document will emphasize anadromous fish management related to private land use activities.

The Action Plan describes the current status and general habitat requirements of the principal anadromous salmonid species in the Smith River Basin. These include fall and spring-run chinook salmon (*O. tshawystcha*), coho salmon (*O. kisutch*), winter and summer-run steelhead (*O. mykiss*) and coastal cutthroat trout (*O. clarki clarki*).

Basic fisheries and stream habitat information is lacking for many tributary watersheds. The Action Plan will discuss tributary issues and needs so that monitoring, assessment, and restoration projects can be identified and priority recommendations can be formulated. As a general rule, current sub-basin habitat conditions should be determined before the initiation of long-term watershed restoration programs. The Action Plan will suggest, however, specific short-term restoration activities that could begin to benefit salmonid populations while monitoring and assessment efforts are being implemented. These recommendations will incorporate existing data with community and landowner concerns.

Baseline biological and physical habitat conditions need to be quantified in order to identify those factors limiting salmonid production. The identification of potential risks to anadromous salmonids enables the formulation of long-term plans for effective protection and management of resources.

Data describing baseline conditions in the Smith will help gauge the effectiveness of future management activities/plans by providing a picture of "before" conditions. Funding opportunities for such projects exist, but require vigilance and coordinated effort by the applicants. The grant-funded position for the Smith River Watershed Coordinator will provide centralized direction for projects.

Finally, this Action Plan will serve as a compendium of Smith River related documents, reports, literature, and plans. An appendix to this Plan will be organized as a bibliography so that interested parties can locate these materials.

Smith River Advisory Council (SRAC)

Formed in 1990, the SRAC is an independent group of representatives from: city, county, state and federal agencies; landowners; fishing groups; Smith River watershed resource users; environmental groups; tribes; and industry. These representatives attend open meetings to discuss Smith River fishery and watershed issues.

Representatives to the SRAC include the following agencies, industries, and groups: Del Norte County, California Department of Fish and Game, U. S. Forest Service, U. S. Fish and Wildlife Service, National Marine Fisheries Service, California Trout, Smith River Alliance, sport fishermen, Del Norte Fishermen's Marketing Association, Lily Bulb Growers, Reservation Ranch, California State Parks, University of California Sea Grant, Humboldt State University Fisheries Department, Institute for River Ecosystems, river guides association, gravel extractors, dairy farmers, Stimson Timber Company, Simpson Timber Company, Native American Tribes, California Conservation Corps, Rowdy Creek Fish Hatchery, Bar-O Boys Ranch, Redwood National Park, Rural Human Services, Friends of Del Norte, Congressional representatives, private consultants, and private citizens or landowners.

SRAC promotes forums that address questions and offer guidance concerning Smith River fisheries issues and supports a basin-wide approach towards Smith River resource management. The goals of the SRAC include the following:

- Coordinate and integrate fishery research and restoration efforts in the Smith River Basin.
- Pursue funding sources to facilitate research and restoration efforts in the Smith River Basin.
- Encourage and/or provide forums and materials to help educate the public about fishery/watershed issues of the Smith River Basin.
- Facilitate the development of a Smith River fishery management plan to benefit the biological, social and economic aspects of the Smith River Basin and Del Norte County. This includes influencing legislation and/or regulatory agencies.

Public Input Process

In order to build a coalition of community involvement and support for this Action Plan, the SRAC sponsored a series of public meetings held during late summer (2001) in Gasquet, Smith River, and Crescent City (Appendix A). Each meeting began with a brief presentation that described SRAC's involvement with the Action Plan and introduced major issues currently facing anadromous fish in the Smith River. During the public question and answer period that followed, SRAC members provided feedback and transcribed detailed notes regarding specific comments and/or concerns. In addition, a take-home community involvement questionnaire (Fig. A1) was made available, along with other documents that provided background information about the SRAC and the Action Plan.

BASIN CHARACTERISTICS

The Smith River Basin encompasses 719 square miles of northwestern California and southern Oregon (Figure 1). It has the unique status as the last major free flowing river in California that drains directly into the Pacific Ocean. The Smith is famous for its water clarity, its world-class salmon and steelhead fishing and its majestic stands of coastal redwood trees. Because of both its geology and its limited development, the Smith River is one of the healthiest river systems in California. The vital existence of anadromous salmonids in the Smith River and the viability of the region's economy depend upon the long-term health of the entire basin.

Federal land management dominates the Smith River Basin. Six Rivers National Forest manages the Smith River National Recreation Area, which includes 305,000 acres, or 476 square miles (McCain et al. 1995). Siskiyou National Forest manages 91 square miles of the basin within Oregon. Redwood National and State Parks have jurisdiction in 25 square miles of the watershed. The total land managed by government agencies is about 83% of the watershed, which leaves 126 square miles in private ownership, predominately in the lower river basin.

Geographic Area

The Smith River flows into the Pacific Ocean four miles south of the California-Oregon state line (Figure 1). The Smith River drains a portion of the west slope of the Siskiyou Mountains, known as the Klamath Geologic Province, with 628 square miles located within California and 91 square miles in Oregon. Approximately 3,100 miles of stream channel are contained in the basin (McCain et al. 1995). The elevation in the basin ranges from sea level to 6,424 feet in the Siskiyou Mountains. The main components of the river are tributary watersheds, sub-basins of the main forks, and the estuary and its drainages. Sub-basins within the Smith River include the North Fork (100,480 acres), Middle Fork (83,200 acres) and the South Fork (186,240 acres) drainages (McCain et al. 1995).

Hydrology

The Smith River is the largest undammed system in California and is susceptible to periodic large scale flooding. The highest recorded flow occurred December 9, 1964, reaching 228,000 cubic feet per second (cfs). Significant impacts to the basin occurred from the 1964 flood event. The magnitude of streamflow is highly variable because it responds directly to rainfall. On November 18 and 19, 1996, the Smith River rose from 400 cfs to 70,000 cfs and dropped to 5,000 cfs in a twelve-hour period (USGS Gauge Station). The flow changes averaged about 10,000 cfs per hour as the result of a nine-inch rainfall in the upper basin. The steep terrain and elevation drop in this short river system creates a fast response time of stream flow to rainfall events (CDFG 1980). The steep gradient within the basin also creates sufficient flows to mobilize most fine sediments that enter the channel and quickly transport them out of the system.

Precipitation falls mainly in the form of rain below the 4000 feet elevation, but fog drip and snow also contribute to yearly precipitation amounts. Over 90% of the basin's precipitation occurs between October and April. Annual rainfall amounts range from approximately 70 inches on the coast to over 150 inches at Ship Mountain and Bear Basin. Precipitation increases with elevation because of cooling and condensation of moisture from rising air masses. The amount of snow stored above 4000 feet in the eastern mountains of the basin does not have a significant effect on river discharge, unless a substantial "rain on snow" event occurs (e.g.: December 1964).

Smith River Watershed

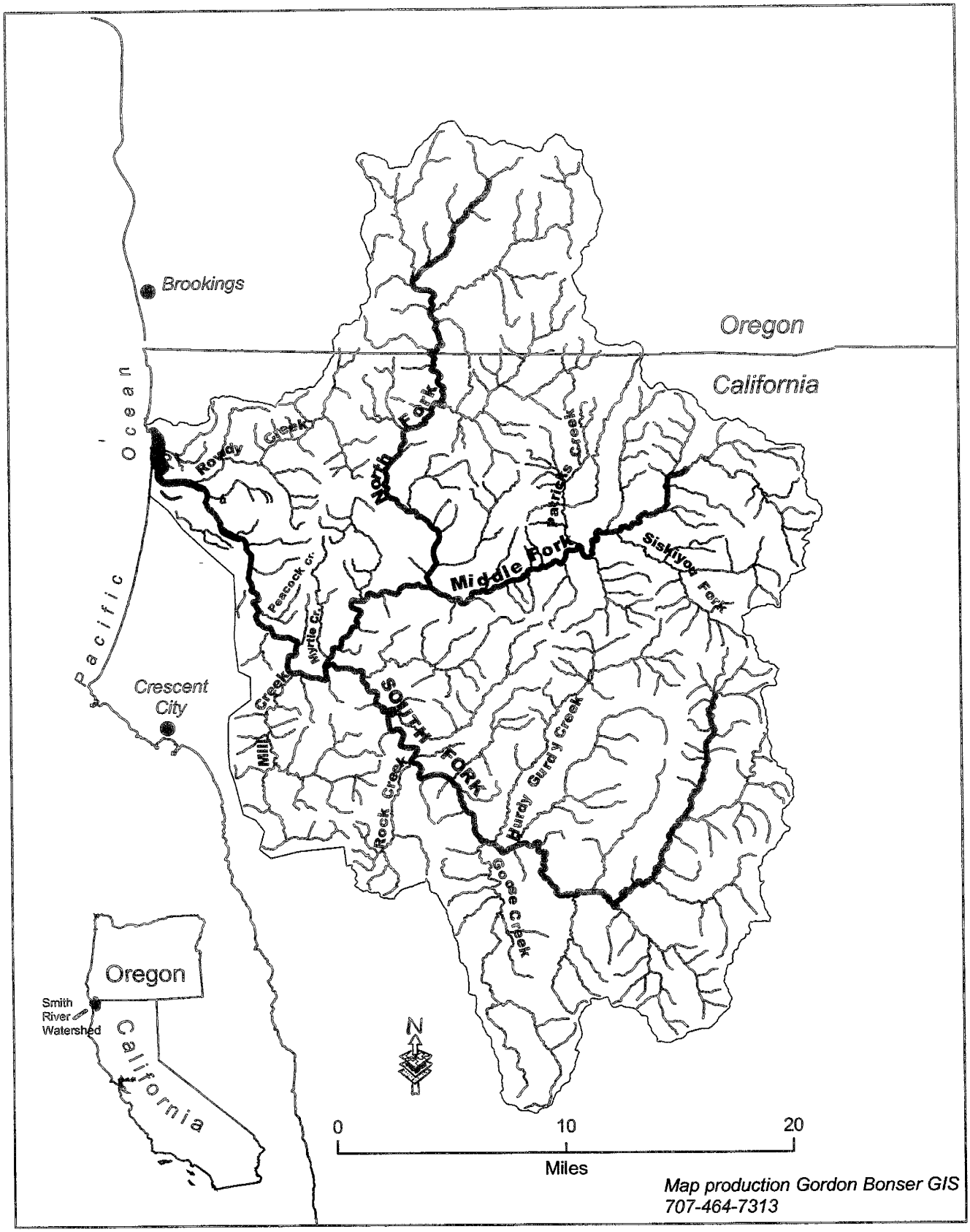

Figure 1. Location of the Smith River Watershed, California

The Smith River drainage has the largest mean annual runoff per square mile (about 2.9 million acre-feet) of any major watershed in California (Rantz, 1969). During low flow periods (summer months) the North, Middle, and South Forks of the Smith River may have individual flows less than 100 cfs each. Low flow situations result in increased stream temperatures, light penetration into the water column and algal growth in the river. The high variability of stream flow is important to the processes and health of the entire Smith River watershed.

Water Quantity

The magnitude of stream flows in the Smith River Basin is directly related to precipitation and runoff. The lowest flows occur from June through October. In the winter and spring, when the majority of precipitation occurs, base stream flow increases significantly. Water for aquatic species is directly linked to this seasonal pattern, because there are no dams for water storage in the basin. The amount of water in the river does not appear to be limiting for human needs, or fishery resources.

Water withdrawal occurs throughout the basin for various purposes. Crescent City and Pelican Bay State Prison remove the most water. Removal occurs from deep "Ranney collector" systems in the gravel and amounts to 2-3 million gallons per day (or 3-4.5 cfs). These extractions occur at a subsurface level and do not appear to affect surface flows in the river. Agriculture pumps the second largest volume from the river and this volume is minimal (Waldvogel pers. com. 2000). Small communities (e.g.: Gasquet, Hiouchi, Big Flat, Smith River) use a combination of water withdrawal and well systems. In extreme drought situations, these water removals may influence water temperature, dissolved oxygen concentration, and/or the amount of habitat available to aquatic species in tributaries to the lower Smith River.

Water Quality

The Smith River is renowned for its water clarity. Its water clarity can be attributed to the geologic parent material that supplies very low concentrations of suspended sediment, even during high flows. Water clarity is at its best typically during low flow conditions and decreases significantly during high flows. The factors responsible are suspended sediments delivered by surface runoff originating from hillslopes, roads and landslides. Some surface runoff occurs from agricultural fields, but is so low in the river system that its influence is minimal.

The amount of oxygen in the water is influenced by cascades and riffles, which force oxygen into solution in the water column. Dissolved oxygen (D.O.) concentration is suitable for salmonids throughout the Smith River basin. D.O. levels can decrease, however, during seasonal low flow periods and warmer water temperatures. In general, D.O. concentration decreases when organic matter decomposes in the water. Types of organic matter that can decrease D.O. are animal waste, leaky septic systems, or green plant material. The oxygen that is removed from the water to decompose organics is not available for use by aquatic organisms.

Septic systems and livestock waste that enter the river contain materials that require more oxygen to break them down (Spence et al. 1996). The waste management system used by Pelican Bay State Prison employs large settling ponds (1/2 acre each) to allow the tertiary treated water to infiltrate into the water table in a purified form. These settling ponds are located near the river and may be compromised during extreme flood conditions (e.g.: 1964), which have not occurred since their construction.

The use of pesticides, fertilizers and herbicides has the potential to affect aquatic conditions. Use of pesticides by agricultural interests and herbicides by timber companies is regulated and monitored by the California Department of Pesticide Regulation (DPR) and Del Norte County Department of Agriculture (Buckels, pers. com., 2000). The quantity and toxicity of industrial chemicals used in the basin is reported each year to the county Agricultural Commissioner. Home use of similar substances, however, is unregulated. In addition, the California Department of Transportation (Cal Trans) keeps internal records of its own herbicide use and these data are only available directly through Cal Trans.

Water quality studies and measurements have occurred in various parts of the basin for many years. Water quality tests can include the following measurements: temperature, dissolved oxygen concentration, pH, suspended sediment concentration, water clarity, presence of fecal coliforms, heavy metal concentration and the presence and concentration of some pesticides, herbicides and fertilizers. No local repository exists for all the water quality tests that have occurred. The North Coast Regional Water Quality Control Board (NCRWQCB) in Santa Rosa, California, possesses most of the studies.

Geology and Soils

The geology of the Smith River basin is old (140 to 300 million years) and complex. A complete description of the geology and soils of the watershed can be found in the Smith River Draft Waterway Management Plan (CDFG 1980). Parts of that document have been highlighted here in the Action Plan. Steep slopes typical of the Klamath Mountains Province dominate the majority of terrain in the basin. The other main component of the basin is the Coast Range Province that was separated from the Klamath Province by the Coast Range thrust fault. The Coast Range Province dominates the western quarter of the basin and the rest is Klamath Mountains Province material.

Five factors and their interactions determine the types of existing soils: climate, living organisms, geologic material, relief and time (McCain et al. 1995). In the Smith River basin, geologic parent material is the primary factor that controls soil types. The Smith River plain has high productivity, low to moderate slopes and low erosion potential. Alluvial fans, river terraces and windblown sand created the Smith River Plain. The Franciscan Assemblage of the Coast Range has highly productive, low erosive potential soils deposited over weathered bedrock. The slopes in the Coast Range are moderate to steep.

Ultramafic rocks (the most common parent material in the basin) when altered over time create a variety of serpentine rocks. The soils derived from the serpentine rocks are often unproductive and tend to be poorly vegetated. These soils range from 1 to 2 million years old and have leached properties resulting in high quantities of metals such as nickel, chromium, or copper (McCain et al. 1995). Ultrabasic rocks of the north central part of the basin are serpentine soils of marginal productivity, high landslide potential on steep slopes, low nutrient supply and high pH.

Plate 2. Sparse vegetation and unproductive soils characterize the riparian corridor in the North Fork Smith River.

Plate 3. The South Fork Smith River, although prone to landslide activity, is typically well forested.

Metasediments of the Galice Formation in the interior Klamath Mountains have highly productive soils on steep slopes with high landslide hazard ratings. Metavolcanics of the Galice Formation have lower productivity, moderate erosion potential and steep slopes which factors increase landslide hazards. The eastern edge of the basin has granitic batholith soils, which have low fertility, moderate slopes and high erosion potential. The geologic materials and soils in the Smith River basin control the characteristics of the sub-basins, which affect the variety of life forms supported.

Many of the Galice formation soils within the Smith River watershed are unusually resistant to erosion, despite the high natural landslide rate. Although the nature of Josephine Opheolite makes it inherently resistant to erosion, the steep character of the hillsides has been instrumental in the creation of landslides. Landslides that occurred during the Pleistocene and Holocene eras have left large alluvial terraces along the Middle and South Forks of the Smith River (McCain et al. 1995). A large deep-seated slide on the South Fork Smith River, known as the Rattlesnake Slide is unique in the basin in terms of magnitude and duration of activity. Most tributaries in the basin contain average gradients of 3% or more and this characteristic helps to provide the power to move recently deposited sediments. Low gradient stream channels (<2%), more typical in lower river tributaries, have a greater tendency to collect slide materials (aggradation). During low-flow months, many of these streams flow subsurface at their mouth because of aggradation.

Climate

Climate within the basin is highly influenced by two factors: elevation above sea level and proximity to the Pacific Ocean. Temperatures near the ocean have minimal variation because of a moderating marine effect. Temperature variation increases inland, where more typical seasonal changes are seen (i.e.: summers are hot and dry; winters are cold and wet). Inland temperatures range from below freezing in winter to 90 degrees Fahrenheit in the summer. Northwest winds influence the creation of a fog belt along the coast during summer upwelling months. This marine layer creates cool moderate temperatures on the coast. The major form of precipitation in the basin is rain. Fog is an important factor along the coast in the summer, as is snow accumulation/melt in the eastern mountains above 4000 feet in the winter.

Vegetation

The unique concentrations of endemic plants have caused the SRNRA to create four botanical reserves in the forest to protect their existence. The factors that influence vegetation types and densities in the Smith River basin are geology, topography, climate, and land management history (McCain et al. 1995). The combinations of these factors have created one of the most diverse plant assemblages in North America (CDFG 1980).

The climax tree defines the forested communities, which are controlled by soil moisture, parent material, slope shape and position (McCain et al. 1995). The following forest types tend to follow a gradient from low to high elevation in a west to easterly direction: redwood, Port-Orford cedar, tanoak, Douglas-fir, white fir, red fir, and mountain hemlock (McCain et al. 1995). Timber harvest and agricultural development have accelerated the disappearance of old growth redwood, Douglas fir, and Sitka spruce in the basin. Second and third growth trees, most often planted after harvest operations were completed, inhabit the majority of merchantable timberlands in the basin.

STATUS OF ANADROMOUS FISH

Background

The Smith River supports four principal species of anadromous fish: fall-run chinook salmon, coho salmon, winter-run steelhead trout and coastal cutthroat trout. Smaller numbers of spring-run chinook and summer-run steelhead also occur in the system. Life history attributes of these salmonid species are presented in Appendix D. Other anadromous fish species that occur within the Smith include chum salmon (*O. keta*), green sturgeon (*Acipenser medirostris*), white sturgeon (*Acipenser transmontanus*), Pacific lamprey (*Lampetra tridentata*), brook lamprey (*Lampetra pacifica*), and American shad (*Alosa sapidissima*).

Historically, salmon were very abundant in the rivers and streams of the Pacific Northwest and the Smith River was no exception. In the late 19th and early years of the 20th century, runs of salmon in the Smith River sustained the operation of a cannery near its mouth. Some cannery records dating from the 1890's documented the processing of 50 tons of salmon per year (Bartson 1997). The cannery operated into the 1930's when CDFG closed in-river commercial fishing in California Rivers.

Since that time, diminishing abundance of chinook, coho, steelhead, and cutthroat populations has been documented coast-wide and in adjacent basins such as the Chetco and the Klamath Rivers (Busby et al.1994). The interaction of human and natural factors over the past 150 years has resulted in substantial declines in west coast wild fish populations and widespread reduction and degradation of associated habitat. In a recent publication, the NMFS evaluated 18 factors contributing to the decline of west coast steelhead (NMFS 1996). These factors include: hydropower development; water withdrawal and diversion; urbanization; land use activities such as timber harvest, agriculture, and mining; over-utilization related to commercial, recreational and tribal harvest; stochastic events such as extended periods of drought and intense floods; artificial propagation; disease; predation; and the failure of existing regulations. The Smith River, however, has not had to overcome as many negative influences as have other rivers. Urbanization and hydropower development are two issues not relevant to the Smith Basin.

Have Smith River anadromous fish runs declined since the 1930's? With reference to the relative health of Smith River anadromous fish runs, NMFS acknowledges in their respective status reviews, a lack of empirical data regarding population trends of steelhead and coho (Busby et al. 1994; NMFS 2001). Recent trend data are available, however, for Smith River coho and chinook stocks (Waldvogel 1980-2001; USFS 1980-2001; and Albro 1994-2001). Some fisheries data are available for most tributaries, but vary in amount and quality depending on location.

Existing data indicate that Smith River populations of chinook, coho and steelhead are most likely in good overall health compared to rivers in other regions of California. While Smith River coho runs are not as relatively large as in other rivers, twenty years of spawning surveys on Mill and Rowdy Creeks indicate viable, self-sustaining coho populations (Waldvogel 1980-2001). Huntington et al. (1996) identified the Smith River as possessing the only healthy winter steelhead population in California. In terms of the ESA mandated recovery process, Smith River fish may provide a valuable source of recolonization in other rivers given the natural straying rates of anadromous fish.

NMFS, the ESA, and ESU's

Concerns over the downward trends in west coast salmon runs have resulted in the National Marine Fisheries Service (NMFS) conducting status reviews for affected species under the federal

Endangered Species Act (ESA). In order to protect species at risk of extinction, the ESA provides a mechanism for identifying and protecting vulnerable species. This legislation divides the responsibility to list fish species between the United States Fish and Wildlife Service (USFWS), or NMFS, depending on whether a fish species spends the majority of its life in freshwater (USFWS) or marine environments (NMFS).

In the case of west coast steelhead and salmon populations, NMFS has carried out the status reviews to evaluate the need to list certain particular "evolutionarily significant units" (ESU's). An **ESU is defined as a "distinct population segment" that has both reproductive isolation, and contributes substantial genetic/ecological diversity to the species as a whole.** In simple terms, most salmon runs occurring in the same ESU are genetically related and are adapted to live in specific (localized) habitats. Salmon in different ESU's will exhibit evolutionarily significant differences such as life history traits (run timing, size, etc.). Managing a species at an ESU-level may aid in the preservation of the overall genetic variation found in a given species as a whole.

Smith River ESU's and ESA status

The current ESA status and ESU for each principal anadromous species in the Smith River are presented in Table 1. A federal ESA listing includes obligations to protect both the species in question and its critical habitats. In the near-future, agency managers will develop wide-ranging management plans for all affected species in an attempt to move populations towards recovery (and de-listing).

- **Chinook salmon:** Smith River chinook are contained within the Southern Oregon and Northern California Coastal ESU. This ESU extends from Punta Gorda, CA northward to Cape Blanco, OR. NMFS determined that chinook from this ESU were "not warranted for listing" under the ESA in 1999. A 1997 status review characterized chinook populations south of the Klamath River as "likely to become at risk of extinction in the foreseeable future," but coastal stocks to the north of the Klamath (including Smith River populations) appeared to be in better overall shape (NMFS 1997). A detailed review of populations within this ESU was conducted by Higgins et al. (1992). Smith River chinook were not identified to be "at risk of extinction."

- **Coho salmon:** Smith River coho populations are contained within the Southern Oregon and Northern California Coasts (SONCC) ESU. After conducting a status review (Weitkamp et al. 1995), NMFS concluded that coho populations in this ESU are depressed, numbering fewer than 10,000 naturally produced adults per year. Furthermore, NMFS decided that existing regulatory structure and conservation measures were inadequate to prevent this ESU from becoming "endangered" in the near future. Consequently, Smith River coho in this ESU were listed as a Threatened Species in May 1997 (Plate #4). NMFS recently published a status review update for the California portion of this ESU which reaffirmed its previous opinion that SONCC coho are not "...presently at risk of extinction, but are likely to become endangered in the foreseeable future" (Weitkamp et al. 1995; NMFS 2001).

- **Steelhead trout:** The Klamath Mountains Province (KMP) ESU encompasses Smith River steelhead populations (Klamath River Basin, CA northward to the Elk River, OR). Smith River steelhead runs appear to be faring better than most other populations in the ESU. In the KMP steelhead status review, the Smith and Winchuck Rivers were assessed as the only rivers (in the ESU) with "healthy and largely natural production of winter run steelhead." (Busby et al. 1994). A federal register notice published in April 2001 concluded that KMP steelhead do not warrant ESA listing at this time.

- **Cutthroat Trout:** Smith River cutthroat populations are contained in the Southern Oregon/California Coasts ESU. The 1999 NMFS status review concluded that cutthroat stocks in this ESU did not warrant listing under the ESA (Johnson et al. 1999). Smith River populations were described as widely distributed and "comparatively abundant", but since quantitative data (for the entire ESU) are scarce, trend detection is difficult (Johnson et al. 1999). In April 2000, a Federal Register notice announced the transfer of jurisdiction over west coast cutthroat stocks from NMFS to the USFWS. This change in jurisdiction was based on the determination that cutthroat trout spend the majority of their life cycle in freshwater habitats.

Table 1. Summary of ESA-related status for principle Smith River anadromous salmonid populations.

Species	ESU	ESA Status	Date of decision
Chinook salmon	Southern Oregon and Northern California Coastal	ESA listing not warranted at this time	9/99
Coho salmon	Southern Oregon and Northern California Coasts	Threatened Species	5/97
Steelhead trout	Klamath Mountains Province	ESA listing not warranted at this time	4/2001
Cutthroat trout	Southern Oregon and California Coastal	ESA listing not warranted at this time	4/99

Plate #4. Carcass of "spawned-out" male coho in the East Fork of Mill Creek, January, 2002.

RESOURCE USERS, MANAGEMENT INFLUENCES, AND ECONOMICS

Overview

This section summarizes many of the private user groups/entities associated with the Smith River whose activities have the potential to affect anadromous salmonids and their habitat. The United States Forest Service (USFS) and the State and National Park Services, however, manage a majority of the Smith River land base contained in the Smith River National Recreation Area (SRNRA) and the various parks. Resource management activities and user group influences are described below in a non-prioritized order, organized by land ownership and subject. Documentation and an understanding of land use activities in the basin are important parts of identifying the relative health of the fisheries and watershed.

Certain land management activities are facilitated if landowners write management documents referred to as Habitat Conservation Plans (HCPs). Private HCPs are not public documents until the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) approves them. When available, each HCP should be referenced for ongoing/planned activities and mitigation measures within Smith River tributary sub-basins. HCPs created by timber companies are intended to manage long term harvest activities and minimize negative impacts upon protected or sensitive plant and animal species.

Federal and State Management

Six Rivers National Forest (USFS) conducted a Watershed Assessment (WA) of the Smith River Basin that includes detailed analyses of the watershed within their jurisdictional boundaries (McCain et al. 1995). The SRNRA WA is a multi-faceted document that covers economic, sociological, biological and geological topics. Redwood National and State Parks are presently creating management plans for lands in their jurisdiction. Recreational activities and impacts on fisheries and upslope areas will be identified to gauge watershed health within park boundaries.

California has recently begun to develop new strategies for natural resource management to protect ESA-listed salmonid stocks. In 1998, California Department of Fish and Game (CDFG) released its "Steelhead Restoration and Management Plan for California" that describes management actions needed to protect steelhead and to avert ESA listings by NMFS. This document emphasizes the need for comprehensive monitoring of salmonid stocks. Also in 1998, CDFG released its "Strategic Plan for Management of Northern California Steelhead Trout."

The Governor of California established the Watershed Protection and Restoration Council (WPRC) to provide oversight of California State watershed protection and restoration activities. In 1997 WPRC released a draft report ("Protecting California's Anadromous Fisheries") that outlines protection and restoration programs the state will use to proactively manage the salmonid stocks of concern.

The five northern California counties affected by the ESA listing of coho (Del Norte, Siskiyou, Humboldt, Trinity, and Mendocino) have created a 5-County Conservation Plan that will establish continuity among the counties for managing anadromous fish stocks. This plan is based on a Memorandum of Understanding (MOU) between the 5 counties to meet the criteria of the WPRC plan.

Privately Owned Lands/User Groups

Agricultural uses in the Smith River basin

The majority of agricultural activities in the Smith River basin occur on the Smith River Plain along the lower seven miles of the river. The Smith River Plain is approximately 12 square miles (7,680 acres), with about 5,000 acres used for agricultural production. This land surrounds the estuary, an important rearing habitat for juvenile salmonids. Annual water usage and impacts to estuarine and riparian habitats are important topics to address with regards to fisheries concerns.

Agricultural industries within the basin include lily and flower production, beef and dairy ranching and some hay production. Agricultural producers have recently started to develop documents (ranch plans) for management of their lands. Industry organizations (e.g.: farm bureau/resource conservation district (RCD)) and the cooperation of landowners allow for a good summary of pertinent activities.

I. Flower Production--

Production of Easter lilies and other ornamental flowers in the Smith River Plain has a significant economic impact on Del Norte County's economy. The lily industry utilizes fields for the production of Easter lilies, which are the primary flower crop in the area. Ornamental flowers are grown in enclosures or "hot houses." In general, the methods used for lily bulb farming are cultivating the soil, treating the soil for pests, planting bulbs, and finally harvesting the bulbs. Lily farmers use a combination of organic and synthetic treatments of the land to maintain consistent crops.

Acreage used for bulb harvest is rotated with pastureland. Typically the rotation involves 3-5 year cycles. One year is needed to grow the lily bulbs and 2-4 years are needed to restore the soil fertility with crops (Lee Riddle pers. com. 1998). In 1976 about 600 acres were cultivated for lily bulb production and current acreage is approximately 550-600 acres (Del Norte County Agriculture Commissioner pers. com. 1998). The A.N. Roberts Lily Research Station which studies all aspects of lily growth is funded by the local Easter lily industry (Lee Riddle pers. com. 1998).

II. Cattle Ranching--

Dairy farming and beef cattle ranching are historic industries on the Smith River Plain. Grazing is rotated to allow for the regeneration of grass. The main issues regarding fishery resources and cattle production are bank destabilization and water quality control (Spence et al. 1996). Wastewater management at the ranches involves separating the solids, then spraying the liquid onto the fields to fertilize and infiltrate. Encroachment of cattle upon watercourses can destabilize stream banks, accelerate erosion, decrease riparian habitat and lessen water quality. Many sections of tributaries on the river are fenced to limit access by cattle, with some access being made to allow livestock watering.

A unique aspect of the Smith River Plain with regard to cattle production is the seasonal presence of the once protected Aleutian geese. Over 30,000 Aleutian (Canada) geese arrive in late winter to feed before embarking on their long migration in mid-April to the Aleutian Islands. During daylight hours, the geese occupy nearby pastures to graze on grass that local ranchers cultivate for cattle. Tilling and planting approximately 300 acres of State Park land near Yontocket Slough have helped to alleviate this annual intrusion. Ranchers are now permitted to haze geese on their pastureland, causing the geese to fly to the State Park land to continue feeding. Increased goose defecation on agricultural lands has the potential to affect river water quality through runoff.

Aggregate Extraction

The free-flowing Smith River allows for an annual recruitment of sand, gravel, cobble, and boulders into the river. In 1974 the Dept. of Water Resources studied the 13.8 miles of river from Hiouchi Bridge to the mouth and estimated an annual recruitment of 330,000 cubic yards of substrate (Del Norte County 1983). This included the influences from the 1955 and 1964 floods, which had deposited large quantities of substrate into the river system over a short period of time. No recent study has been conducted to estimate annual recruitment, but future updates to these data are currently proposed by Del Norte County. The annual "harvest" of gravel from the river ranges from 80,000 to 100,000 cubic yards (Del Norte County Planning Department pers. com. 1998).

Aggregate extraction in the Smith River basin occurs from Sultan Bar, near the mouth of Sultan Creek (river mile 8.5) downriver to the Reservation Ranch Bar (approximately 1.5 miles upstream of the river mouth). Gravel is removed for road construction, water and sewer projects, building foundations and other purposes. The equipment used to extract gravel includes tractors, graders and excavators. Gravel is stockpiled out of the riverbed. Each extraction site is designated for specific quantities of annual gravel removal.

Obtaining a permit from the county involves providing maps, cross-sectional profiles, aerial photos, operational plans, an operating season, methods and site clean up plans (Del Norte County Ordinance Chapter 7.36, 14.05). The CDFG warden oversees the implementation of gravel operations. CDFG issues 1603 Streambed Alteration Agreements and provides input to protect affected natural resources. In 1997 the U.S. Army Corps of Engineers (COE) expanded its jurisdiction to include all gravel extraction operations. The COE requires a separate permitting process entitled a "Letter of Permission" (LOP). The gravel operators in Del Norte County annually submit their applications for the LOP. The recent ESA listing of coho, however, has required gravel operators to undergo consultations with NMFS prior to receiving their operating permit. Gravel operations in the Smith River have been progressive in terms of their methods of harvest, surveying protocols and cooperation with involved agencies. Del Norte County received an Award of Excellence in 1996 from the California State Lands Department for its innovative methods of gravel extraction and for the cooperation among gravel operators.

Aggregate extraction in and near the river channel does have the potential to impact anadromous fish and their habitat. Of particular interest in the lower Smith River is the occurrence of mainstem spawning by fall-run chinook salmon. Large chinook salmon are able to utilize the larger substrate in the mainstem Smith and redds have been documented in close proximity to gravel extraction sites (Smokey Pittman pers. com. 1995; Zack Larson pers. com. 2000). The season for gravel extraction operations extends from 1 May through 15 October in order to avoid disturbing adult salmonids during the peak spawning months (November-April).

In general, gravel extraction has the potential to increase suspended sediment, sediment transport, water turbidity, and gravel siltation (OWRRI 1995). Salmon redds downstream of extraction sites are susceptible to deposition of displaced sediments resulting in egg suffocation or suppressed fry emergence. Fine sediments decrease survival of incubating fish eggs as blockage of interstitial spaces by silt prevents both oxygenated water from reaching the eggs and removal of metabolic wastes (Chapman 1988; Reiser and White 1988). Research is needed to document the extent of chinook spawning activity in the mainstem and to investigate impacts (if any) from aggregate extraction operations. Long-term management strategies should incorporate these findings so that appropriate operational guidelines can be adopted.

Timber Harvest

Timber harvest activities on private land are governed by California Forest Practice Rules that are enforced by the California Department of Forestry and Fire Protection (CDF). The following is a brief description of how timber harvest activities occur (C. Howard pers. com. 2001-2002):

1. Initially, a Timber Harvest Plan (THP) is created to delineate an area to be harvested and state the methods of harvest, specify road construction, and identify/classify watercourses. A Registered Professional Forester (RPF) creates this document. The THP also addresses issues such as wildlife, fisheries, water quality, archaeological resources and plant communities and must show how the harvest will minimize or eliminate ("mitigate to insignificance") short term and cumulative impacts. Impacts to the aforementioned resources must be shown to be "less than significant."
2. A THP is then submitted to the regional CDF office for review which usually includes an on-site inspection of the plan area.
3. The CDF then approves, amends, or denies the permit.
4. If public concerns are raised regarding a specific THP, then the CDF receives public comment and addresses those concerns with the forester and/or landowner. Timber harvest plans have received increased public review and input in the last twenty years with regard to endangered species and sensitive habitats.
5. Once a THP is approved by the CDF, a proposed area is harvested according to the plan.
6. After harvest is completed, CDF inspects the site to confirm compliance and regeneration of timber stands.

Wide ranges of methods can be utilized to remove timber. When "even-aged" harvest methods are used, replanting of seedlings is utilized to re-stock the area for future harvest. Prior to replanting, preparation of the land may be necessary. Logging debris that remains after a harvest is often burned (controlled burns). New seedlings are then planted to regenerate the forest. During the growth process, seedlings often get "out-competed" by nearby shrubs that stunt their growth or kill them entirely. To aid in conifer recruitment and reforestation, herbicides are used to control shrub growth in planted areas. The RWQCB monitors water quality and DPR regulates herbicide application related to timber harvest activities. Numerous conditions must be met prior to application. The County Agriculture Commissioner issues permits regarding controlled chemicals and is the local enforcement agent in this process.

In order to facilitate long-term timberland management in Del Norte County, some timber companies are in the process of developing HCPs. HCPs consider a variety of multiple species resource issues and develop long-range management plans, often in the range of 25 to 50 years. Many agencies (USFWS, NMFS, and CDFG) review the HCPs and work with timber companies to develop sound, scientifically based plans, with the primary goal of using the land for sustainable timber harvest while protecting habitat for wildlife and fish.

The SRNRA encompasses over 300,000 acres of the Smith River watershed and has historically been managed for timber harvest as well as for recreation. Currently timber harvest is restricted to specific areas and is no longer the main objective of federal land management in the basin. The limited timber harvesting that occurs in the SRNRA meets all requirements under the Wild and Scenic Rivers Act and the 1994 Federal Forest Plan (called the "President's Plan").

Transportation Related Issues

Local community members have voiced concerns regarding the transportation of hazardous materials via trucks on State Highway 199. The Middle Fork of the Smith River snakes its way directly below much of Hwy 199 and the dangers of a catastrophic toxic spill into the river are real. Small crashes have occurred in the past resulting in leakage of contaminants into the river or its tributaries. Due to the remote nature of this area, response times for specially trained personnel take many hours and sometime days. Mike McCain of USFS and Don Kelly of CDFG head the local response team when a hazardous spill occurs. Many times the type of spilled substance may not be known. The training and stationing of a "local" hazardous incident squad on the north coast would greatly speed up reaction times when spills occur. Other fisheries related transportation issues include: road maintenance and road construction on state, county, and private lands; and pollution associated with roads adjacent to the river.

Chemical Use

The Del Norte County Agriculture Commissioner oversees the use of chemicals in the Smith River basin. Two general categories are defined: restricted and non-restricted. Restricted chemicals require a permit for application, while non-restricted chemicals do not. All commercial use of pesticides must be reported to the Agriculture Commissioner. Monthly reports are sent to the Commissioner's office for non-restricted chemicals used by businesses such as ranches, farms, and timber companies. Private/home use of small quantities of chemicals is not required to be reported, yet collectively may represent a sizable portion of the overall use in the watershed. The California Department of Transportation (Cal Trans) reports its pesticide use monthly, but these data are archived in-house. When a restricted chemical is to be applied, the permittee must notify the Agriculture Commissioner 24 hours in advance. Numerous conditions govern the use of restricted chemicals, including wind and rainfall thresholds. The Agriculture Commissioner is the local enforcement agent for pesticide use and performs site inspections at times of application. A list of chemicals reported to the Del Norte County Agriculture Department during 1999 is found in Appendix F (T. Sousa pers. com. 2001).

Uses of pesticides to control diseases and nematodes are integral to lily and flower production. The main issues regarding fishery resources and flower production are the use of pesticides and the subsequent runoff that occurs from the fields during the rainy season. Early in the fall, fields are treated with nematicides; then bulbs are planted. A study conducted by the Regional Water Quality Control Board (RWQCB) evaluated the leaching properties of certain nematicides (Warner et al. 1989). A network of wells was established to monitor the movement of groundwater and test for chemicals. Monitoring was discontinued by the RWQCB in the early 1990's because no detectable chemicals were found at any of the sites (Lee Riddle pers. com. 1998).

Water Removal

Water is withdrawn by local communities and by Pelican Bay State Prison for residential use. The following conversions provide a reference to understand the quantities of water used:

1 cfs (ft^3/sec)= 7.48 gal./sec.
1,000,000 gal/day= 1.55 cfs
1 acre-foot = 325,851 gallons

The Smith River Basin has abundant precipitation and ample water resources. For a watershed the size of the Smith River (719 square miles), the mean annual runoff of 2.72 million acre-feet illustrates that it has one of the highest ratios of runoff per acre of any watershed in California (McCain et al. 1995). Groundwater in the Smith River Plain was estimated at 99,000 acre-

feet of storage (Del Norte County 1983). The Smith River has no dams and its flow seldom goes below 200 cfs (USGS Gauge Station). The majority of precipitation falls as rain between October and April, with peak discharge typically occurring in December-March. However, the Smith River is subject to low flows during dry months (July – September) even after exceptionally wet winters. Precipitation that occurs as rain or fog during the summer does not contribute a significant amount of water to the river or to the groundwater table.

The Crescent City Public Works Dept. and the North Coast Regional Water Quality Control Board (RWQCB) office in Santa Rosa have information on water rights and quantity use. The California Dept. of Health Services documents all water quality testing for municipal or residential water uses. The Smith River is not listed by the RWQCB as an impaired water body and the water quality in the basin is considered excellent.

Smith River water is withdrawn for municipal and residential uses from a Ranney Collector site on the mainstem of the Smith River. The Ranney Collector withdrawal of subsurface water from the river system appears to have no detectable effect on Smith River summer surface flows. Crescent City used 977 million gallons in 1997, which is the approximate average of their annual use (Crescent City Public Works Dept. pers. com. 1998). The Ranney Collector also supplies water to Pelican Bay State Prison (PBSP). In 1997, PBSP used 260 million gallons of water (Paul Woodring pers. com. 1998). Two other community service districts (Bertsch-Ocean View C.S.D. and Churchtree C.S.D.) use the Ranney Collector and the Crescent City Public Works Department documents those quantities.

The Smith River Community Services District (SRCSD) operates three wells near Rowdy Creek that supply water to the town of Smith River, nearby residents and businesses. These wells have the capacity to withdraw up to 800 gallons per minute, which translates into 1.15 million gallons per day. In 1997 the SRCSD withdrew 96.3 million gallons, which is their approximate average per year (SRCSD pers. com. 1998).

The other communities in the watershed that have water districts include Gasquet, Hiouchi, North Bank Road, and Big Flat. The methods of water removal include direct withdrawal from the river, well systems, or well pumps located near streams. These small communities have a negligible influence on aquatic systems since the quantities of water used are small compared to instream volumes.

Agriculture uses mostly groundwater with some direct extraction from the Smith River. In 1976 water use was estimated at 40% for irrigation, 35% for municipal and residential and 25% for timber mill operations (Del Norte County 1983). Water use has changed substantially in the past twenty years with the closure of all timber mills, the existence of PBSP and the expansion of residential communities. In most years, water withdrawal does not appear to be a factor in influencing aquatic habitat. However, water use should be evaluated and documented with fishery resources in mind for any anticipated future community growth.

Wastewater Treatment

Treatment of wastewater by Smith River communities varies from the technically advanced to simple septic systems. The Crescent City Wastewater Treatment Plant utilizes secondary treatment of wastes before discharging them into the Pacific Ocean. No wastewater from their treatment plant enters the Smith River. The waste treatment facility at PBSP utilizes a tertiary treatment process, which involves pumping secondary treated water (de-chlorinated) into filtration ponds near the Smith River (Paul Woodring pers. com.1998). The facility at PBSP, the most advanced waste treatment method used in California, has received state recognition for its performance.

The Smith River Community Services District does not have a wastewater treatment facility and the town of Smith River utilizes septic systems to treat wastewater. Septic systems are the most frequently used method of waste treatment in the outlying communities of the watershed. Septic systems are required to meet Del Norte County planning regulations based on state guidelines.

Sport Fishing Industry

Fish occupying the Smith River system include freshwater and estuarine species. A list of species documented to inhabit this system is shown in Appendix C. Angling activities focus upon the four main salmonid species: chinook salmon, coho salmon, steelhead trout, and coastal cutthroat trout. Some angling effort takes place for redtail perch, smelt, and lamprey ("eels") at the river mouth (estuary).

Fishing pressure in the summer months typically targets juvenile steelhead, which many anglers believe are resident trout. Some coastal cutthroat trout are also caught during summer months. Although the CDFG recognizes that summer angling targets juvenile steelhead, they have documented that the impact has been biologically insignificant (Taylor and Lytle 1987). Effective in 1998, changes to the fishing regulations now require the release of trout less than eight inches, a limit of five wild fish taken per year and the use of only barbless hooks. These emergency regulations adopted by the CDFG limit angling impacts on juvenile salmonid populations. On coastal rivers, trout season starts in late May and lasts through mid November. Angling in the Smith River after October 1 is controlled by river flows. CDFG requires a minimum flow of 400 cfs to open the river to fishing upstream of the confluence of Rowdy Creek. These regulations are intended to increase the survival of adult salmonids.

The fall and winter seasons see the highest intensity of angling pressure. Boat and bankside anglers arrive in large numbers when river conditions are right. Anglers travel hundreds of miles (often from other states) to participate in the Smith River's renowned salmon and steelhead fisheries. In 1996-97, Sea-Grant research documented over 150 fishing guides working the Smith River during the fall-run salmon and winter steelhead seasons. These salmon and steelhead fisheries have significant economic importance to Del Norte County's economy. Each year salmon and steelhead enhancement fish derbies are conducted on the Smith River to raise funds for the Rowdy Creek Hatchery.

Fishery surveys by the Sea Grant extension program documented Smith River fishery management issues, sportfishing user conflicts, fishery regulations, and fishing etiquette (Waldvogel 1991). Sport fishery creel surveys have also been conducted by CDFG in 1987 and in 1997-2000.

Rowdy Creek Fish Hatchery

The only privately run salmonid enhancement hatchery in California, as well as the only hatchery facility in the Smith River Basin, is located at the confluence of Rowdy and Dominie Creeks. The hatchery is operated by a non-profit organization to supplement the salmon and steelhead populations in the Smith River. RCH was created in 1972 with support from the local community (Kiwanis Club) to restore salmon runs in the Smith River. Since RCH began, state funds and private donations have provided the hatchery with operational funds. The objective of RCH is to produce salmonids that can be caught by sport and commercial fishermen in river and ocean fisheries.

Hatchery operations produce steelhead and chinook. Trapping hatchery and wild adults that migrate upstream in Rowdy Creek supplies the hatchery with brood stock. RCH staff is aware of concerns regarding inbreeding of hatchery brood stocks. The spawning operations utilize techniques that reduce the inbreeding of year classes. When possible a wild adult is spawned with a hatchery adult. If only hatchery adults are available, then all adults are spawned with fish of a different year class to avoid inbreeding of a given brood year. Approximately 500,000 chinook eggs and 150,000 steelhead eggs are taken annually. Fertilization rates for both species typically exceed 90% (Bob Will pers. com. 1998). The eggs are incubated and the resulting fry are moved to holding ponds where they are reared.

In general, as is the case with any supplementation program, there is the potential for hatchery fish to have impacts upon remaining native populations by straying and interbreeding with natural fish (Nehlsen, 1996). Another potential ecological impact from hatchery releases is an increased competition for food and space with wild juvenile salmonids. The genetic and life history characteristics of native salmon and steelhead populations in the Smith River should be carefully monitored and any changes addressed appropriately.

The CDFG has instituted a policy to mark fish produced by private hatcheries throughout California. When the juvenile fish are large enough, they are marked (fin clipped) to identify them as hatchery fish. RCH marks all steelhead smolts and as many chinook yearlings as possible depending upon time constraints and volunteer help. All steelhead released from RCH receive adipose fin clips and yearling chinook salmon receive left maxillary fin clips.

The records of adult fish trapped, numbers of juveniles released, and water temperatures have been kept throughout the hatchery's operation. These data represent one of the better information sets on fish population trends in the Smith River basin.

Recreation

Recreational water activities are varied on the Smith River system. Most take place in summer months when river flows are lower and water temperatures higher. Two wintertime water sports, however, are on the increase: white water rafting and kayaking. A national kayaking competition takes place on the South Fork Smith each year. The North Fork Smith has class 4 and 5 rapids at high river flows.

Summer river activities include swimming and sunbathing, scuba diving, river rafting, skin diving/snorkeling, recreational gold panning, jet skis (mainly in lower river), bird watching, and canoeing. Most of these pursuits do not directly affect fish or their habitat. Winter kayaking, however, can conflict with bank fishermen, jet skis can cause noise pollution/leak fuel, and some skin diving activity in past years has been tied to the poaching of summer steelhead and spring chinook (Don Gastineau pers. com. 1999).

RECOMMENDATIONS

The primary purpose of the Action Plan is to provide guidance for coordinated actions that will maintain and enhance the abundance, diversity, and health of anadromous fish populations. The Action Plan provides direction for resource managers by giving priorities to important issues involving anadromous fish in the Smith River, but the plan itself carries no regulatory authority. Ultimately implementation of the Action Plan's recommendations will be accomplished through cooperation with CDFG.

This section outlines a strategy designed to accomplish the stated purpose by our addressing important biological issues in a cooperative and economically sound manner. The success of this plan must involve a foundation of scientific knowledge, efficient allocation of resources, a supportive community and sustainable economies. Success will also require the integration of meaningful short-term restoration projects (1-10 years) with long-term planning efforts and projects to be implemented over a longer time span (10-100 yrs).

Categories

Recommended actions that will maintain or enhance the abundance, diversity and health of anadromous fish populations are organized by categories of subject or entity. The categorization is intended to list recommendations for easier reference, discussion, and implementation. Consistent and diligent effort to implement each of the recommendations is essential.

1) Limiting Factors Analysis

- Conduct comprehensive review of Smith River fisheries data and restoration activities in existing documents such as the USFS WA, CDFG stream files, and timber company or other survey efforts. Limiting factors identified by existing documents will be prioritized for initial restoration efforts.

- Identify data gaps preventing a thorough analysis of the factors limiting the abundance and diversity of anadromous fish. Develop a coordinated monitoring plan that will specifically address these gaps. Aquatic, riparian, and upslope habitats in many Smith River tributaries and the estuary will need to be surveyed. The data collected for each stream could include: a quantitative inventory of aquatic and riparian habitats; a quantitative assessment of upslope conditions (and road crossings/culverts); documentation of fish species presence/distribution and relative abundance; an inventory of benthic macroinvertebrates; an assessment of nutrient cycling in major tributaries; and studies of ecosystem processes (e.g.: predator/prey relationships in the estuary). Close coordination with CDFG staff and other professionals involved with watershed assessment in the region is vital.

- Collect sources of existing scientific information into a database and bibliography. Information gathered and reviewed through the implementation of this Action Plan should be made available for subsequent analyses and as a baseline for coordinated monitoring. Data sources should be clearly identified and components stored for easy sharing.

- Develop a long-term restoration plan based on the outcome of the limiting factor analyses. Future long-term restoration efforts should address these identified issues, giving priority to upslope work where appropriate. All instream restoration projects should include "before and

after" monitoring of physical and biological conditions. Other watershed restoration efforts (i.e.: upslope) should incorporate post-project effectiveness monitoring.

- Develop and use GIS to support coordinated monitoring, limiting factors analysis and conservation/restoration planning.

2) Watershed Restoration Projects

- Identify long-term economically feasible projects that can restore critical downstream habitats common to all salmonid species. These habitats include the estuary and associated sloughs, flood plains and wetlands. Types of projects can include riparian planting, habitat structure placements (e.g., large woody debris structures, rootwads), alteration of existing estuary habitats and structures, stock management in riparian zones and channel modification.

- Documented watershed "issues" can be remedied while various baseline data collection efforts are being implemented. The first round of "short-term projects" should address problems with fish passage and access to habitat. Returning fish to lost spawning and rearing habitats is a valuable first step of restoration. An assessment of Del Norte county road culverts completed during the year 2000 classified several Smith River basin culverts as either "high" or "moderate" priorities for repair/replacement based on their impacts on anadromous fish (Taylor and Associates 2001). Other culverts are located on federal, state and private roads and are also being assessed. In addition, recurring and/or seasonal difficulty in fish access has been identified at the mouths of certain Smith River tributaries, including Dominie Creek, Morrison Creek, Clarks Creek and Cedar Creek (Waldvogel pers.com. 2000).

  Examples of Initial Watershed Restoration Projects:

  - Yontocket Slough at Pala Road crossing. Culvert modification project tentatively approved for completion by California State Parks.

  - Clark's Creek at Walker Road crossing. Culvert rated a "high priority" due to the severity of the barrier, species diversity and quality of upstream habitats (Taylor and Associates 2001). The CalTrans Hwy 199 culvert crossing is already slated for assessment. Periodic fish access at the mouth is also an issue.

  - Peacock Creek at Tan Oak Drive crossing. This culvert was rated a "high priority due to the severity of the barrier and species diversity (Taylor and Associates 2001). This culvert modification project has already been submitted for funding and project implementation is pending approval from CDFG in 2002.

  - Peacock Creek water diversions. Work with local landowners to develop alternatives to current water use patterns in the watershed. Currently, diversions cause seasonal de-watering of stream reaches downstream of Hwy 197.

  - Morrison Creek- limited fish access at the mouth. Recurring difficulty in fish access to and from the mainstem Smith River will require working with private landowner to assess opportunities to enhance access for anadromous salmonids (Crockett pers. com. 2001)

  - Rowdy Creek upstream of Hwy 101. Stream is highly channelized adjacent to old (vacant) mill site. Restoration options include the re-establishment of natural

stream meanders, creation of riparian wetlands and identification/disposal of materials associated with old mill site. Recently, similar restoration projects have been successfully implemented in the Willamette River Basin (Oregon).

- Ritmer Creek at Oceanview Road crossing. This estuary tributary was rated a "moderate priority due to limited upstream habitat (Taylor and Associates 2001).

3) Land Manager Program Activities

- Aid in the development of comprehensive habitat management plans (Habitat Conservation Plans) for sub-watersheds that include private lands.
- Support an annual CDFG creel census of the Smith River fisheries.
- Encourage and participate in estuary and lower-river restoration planning and projects.
- Encourage and promote funding for lower Smith River landowners to enhance riparian areas and manage stock around stream riparian corridors.
- Obtain and consider progressive ideas that have resulted in successful land stewardship on west coast dairies, ranches and other agricultural lands.
- Support the creation/development of a Resources Conservation District (RCD) to aid in the implementation of Action Plan recommendations.

4) Recreational User Program Activities

- Develop a volunteer catch and release education program promoting the values of native Smith River anadromous salmonids.
- Encourage cooperation between California and Oregon fishery regulators in order to adopt consistent sport fishing regulations for similar anadromous fish species.
- Consider conservation measures that include non-retention of chinook salmon above the Forks and the non-use of roe/bait by anglers.

5) Rowdy Creek Fish Hatchery (RCH) Program Activities

- Support local and regional efforts to minimize potential ecological and genetic impacts of hatchery fish to wild salmonids by following the standards of the CDFG/NMFS memorandum of understanding (MOU) on hatchery releases.
- Continue the 100% marking program for steelhead and support increased marking of juvenile chinook salmon.
- Develop release strategies that reduce or eliminate predator attraction to emigrating juvenile salmonids.
- Support the evaluation of the location and catch rate of RCH marked steelhead caught in the sport fishery above the confluence of the Middle and South Forks of the Smith River.

- Aid fishery researchers in life history and migration studies of salmonids.

6) Regulatory Agency and Industry Involvement

A. County

- Revise the County General Plan to include riparian zone, chemical use, grading, water quality and land development ordinances that benefit fishery resources.
- Conduct an inventory and assessment of Del Norte County road culverts (completed in 2000).
- Review the County Highway herbicide spraying procedures and identify alternatives.
- Support a review of gravel mining effects on fish populations (e.g., chinook salmon mainstem spawning) and on lower river and estuary morphology.
- Improve road maintenance practices such as grading and side casting.
- Summarize local water rights information in order to create an overall picture of water use/withdrawal in the system.

B. State

- Seasonally increase Fish and Game personnel to help enforce existing fishery regulations (poaching). Provide adequate personnel for biological monitoring of the Smith and employ a full-time biologist to be stationed locally.
- Work closely with County Planning Dept. to develop a local conservation plan.
- Review all future water diversions for public or private use and promote fish-friendly water conservation practices.
- Support full enforcement of Water Quality Control Standards.
- Continue the present monitoring of EPA approved chemicals used within the Smith River basin and look into potential related impacts on anadromous fish.
- Provide for more stringent enforcement of substance/material transportation regulations on state highways.
- Establish a Hazardous Materials emergency response team in a Del Norte/Humboldt County location which could rapidly respond to hazardous spills in remote areas (i.e.: Hwy 199 along the Smith River).
- Review CalTrans roadside vegetation management procedures.
- Complete culvert assessment studies by CalTrans.

C. Federal

- Enact watershed protection components of the President's Forest Plan (1993) for federal lands.

- Enforce the Clean Water Act.

- Provide adequate field staff for the USFS SRNRA fisheries biologist. Assist with the development and procurement of funding for restoration projects identified by the USFS SRNRA fish restoration program.

- Support private land conservation easements and tax incentives through the local Resource Conservation District (RCD).

D. Tribal

- Work with local tribal governments to restore fisheries and the lower river in ways that restore and promote traditional cultural values and uses.

- Utilize historical pre-settlement fisheries and river condition information from tribal sources in the development of goals, as well as in all aspects of fisheries restoration.

E. Industry

- Work cooperatively in developing enhancement and restoration efforts, population monitoring and upslope assessments within major anadromous tributaries.

- Complete HCPs in progress as needed for timberland management.

- Encourage the use of multiple extraction techniques for gravel operations on the Smith. Where appropriate, these should include channel trenching, bar trenching and skimming.

- Participate in an objective study of impacts caused by each extraction technique on juvenile salmonid rearing and adult spawning habitat.

- Consider alternatives to chemical use.

7) Smith River Advisory Council Opportunities for Support

A. Monitoring and Evaluation Programs

- Work towards adopting a common set of scientifically sound methodologies to be used by all Smith River monitoring and assessment projects.

- Continue monitoring of salmonid populations in Mill Creek, Patrick Creek, Rock Creek, and Rowdy Creek.

- Establish and coordinate long-term quantitative data collections that monitor adult and juvenile salmonids in the Smith River.

- Support the development of information systems (e.g.: GIS) designed to provide access to data concerning Smith River fisheries. Such systems will better enable resource

managers, landowners and restorationists to make decisions for the benefit of fisheries resources. Such systems will also increase and enhance educational opportunities.

B. Public Involvement Program

- Develop volunteer crews for watershed monitoring surveys, clean-up days and enhancement projects.

- Support and Expand "Stream and River Clean-up Day" community activities.

- Establish communication with individuals and agencies to create a forum for reporting yearly basin activities. Facilitate year-round tracking of basin activities through the SRAC Watershed Coordinator's office and Coastal Streams Habitat Improvement Program.

- Promote a community water quality monitoring program for basin-wide aquatic habitats of the Smith River.

C. Education

- Support/promote research investigating basin health and fishery issues including Humboldt State University graduate studies related to Smith River anadromous fish populations.

- Continue the Classroom Incubation Project in Del Norte County School District with support from RCH.

- Continue the presentation of a Smith River Colloquium where watershed issues, restoration projects, research and studies can be presented to the public.

- Educate the public on the value of anadromous fish populations, the basin-wide components of fish habitat and effects upon fish and their habitat from human activity. Also publicize information about fish-friendly programs or options through collaboration with journalists/media, outreach, public presentations and support of educational workshops.

- Seek long-term funding sources for the Watershed Coordinator position and the development of a SRAC website.

D. Enforcement

- Contact local law enforcement to investigate possibilities of creating streamside "neighborhood watch" programs to help the wardens in safe and constructive ways.

- Increase public awareness of fishing regulations and the existence of the CALTIP program.

8) Economic and Funding Considerations

- Goods and services for restoration projects should be purchased or obtained from local businesses and individuals to enhance our economy, foster sustainability and create a feeling of watershed stewardship.

- Identify conservation easements and tax incentives for habitat restoration to alleviate the burden on private landowners.

- Investigate federal, state and private funding opportunities to implement enhancement projects.

- Utilize local non-profits as "fiscal receivers" to support community participation.

- Provide support for organizations/individuals seeking funds and otherwise working to implement the Action Plan.

Summary of Action Plan Recommendations

Short-term implementation

Develop a list of initial restoration activities that will have immediate benefit for anadromous fish. Baseline data collection efforts should be initiated in the estuary and selected tributaries to address data gaps. SRAC should direct efforts to generate community and business sector interest and involvement with Smith River related restoration activities through public outreach and education programs.

Long-term implementation

Results from estuary and tributary baseline data collection efforts should be analyzed to determine factors limiting the abundance and biodiversity of anadromous fish in the Smith River watershed. Next, community-identified values, local issues and the limiting factors analyses should be integrated into a coordinated conservation/restoration strategy. During this process, a comprehensive monitoring plan to track the effectiveness of implemented projects should be developed. Finally, quantitative data describing fish populations and physical habitat parameters should continue to be collected in selected tributaries to detect trends/changes over time.

Plate #5. Fishing for steelhead at the confluence of the Middle and South Forks of the Smith River, January, 2002

SMITH RIVER SUB-BASIN SUMMARIES

Issues and Needs Assessment

Developing the "best plan for action" requires first using the best scientific methods to gather a body of current and historical knowledge. An initial approach is to begin at the river mouth and move upstream identifying issues of concern and data collection needs for each tributary. Since a watershed assessment document had been published (McCain et al. 1995) that addressed federal ownership within the watershed, CDFG expressed interest that this Action Plan focus on areas of the Smith River that had not been studied as closely: privately held lands. This document recognizes the need for a "whole watershed" perspective on topics such as watershed restoration and to that end recommends referencing the USFS WA (McCain et al. 1995) for information not presented here.

This chapter will first introduce each tributary watershed with a brief background description and then summarize known fisheries-related issues, restoration actions needed and restoration accomplishments to date. Many of the sub-basins listed below have limited watershed information. Data gaps include fish population estimates, riparian habitat surveys, water quantity and quality, upslope assessments and aquatic habitat availability/suitability. Conducting watershed assessments in key tributaries will help to fill data gaps and identify priorities for restoration work (specific factors limiting salmonid production).

Smith River Estuary
(Figure 2)

- Background: the Smith River estuary is a major component of the entire basin. The Army Corps of Engineers defines the estuary as extending just above the mouth of Rowdy Creek and contains 4.5 miles of waterway. Its drainage encompasses approximately 15 square miles, excluding Rowdy Creek.

  The town of Smith River is the largest population center in this sub-basin. The estuary area contains stable soils, flat to moderate hill slopes, a river channel 100 yards to 1/4 mile wide, and river depths from 1 to 14 feet in the summer. Land activities adjacent to the estuary include lily bulb farming, cattle production, timber harvest, gravel extraction, road maintenance and residential development.

- Issues of Interest: summer habitat (cover) needs for juvenile salmonids; adult salmonid holding habitat; predation on salmonids; habitat changes (sloughs, water depth) in estuary over time from land use practices; and gravel extraction.

- Actions Needed: survey estuary for fish species, relative abundance and habitat use; monitor salmonid predation related to hatchery releases; quantify available aquatic and riparian habitat; quantify gravel extraction and its effects on estuary morphology; study bird and mammal predation on juvenile and adult salmonids.

- Accomplishments and Restoration Activities: juvenile salmonid habitat structure placement (brush structures); 3-yr. Sea Grant funded estuary study focusing on habitat use, food preference and life history attributes of juvenile chinook salmon in the estuary (Quinones et al. 2001).

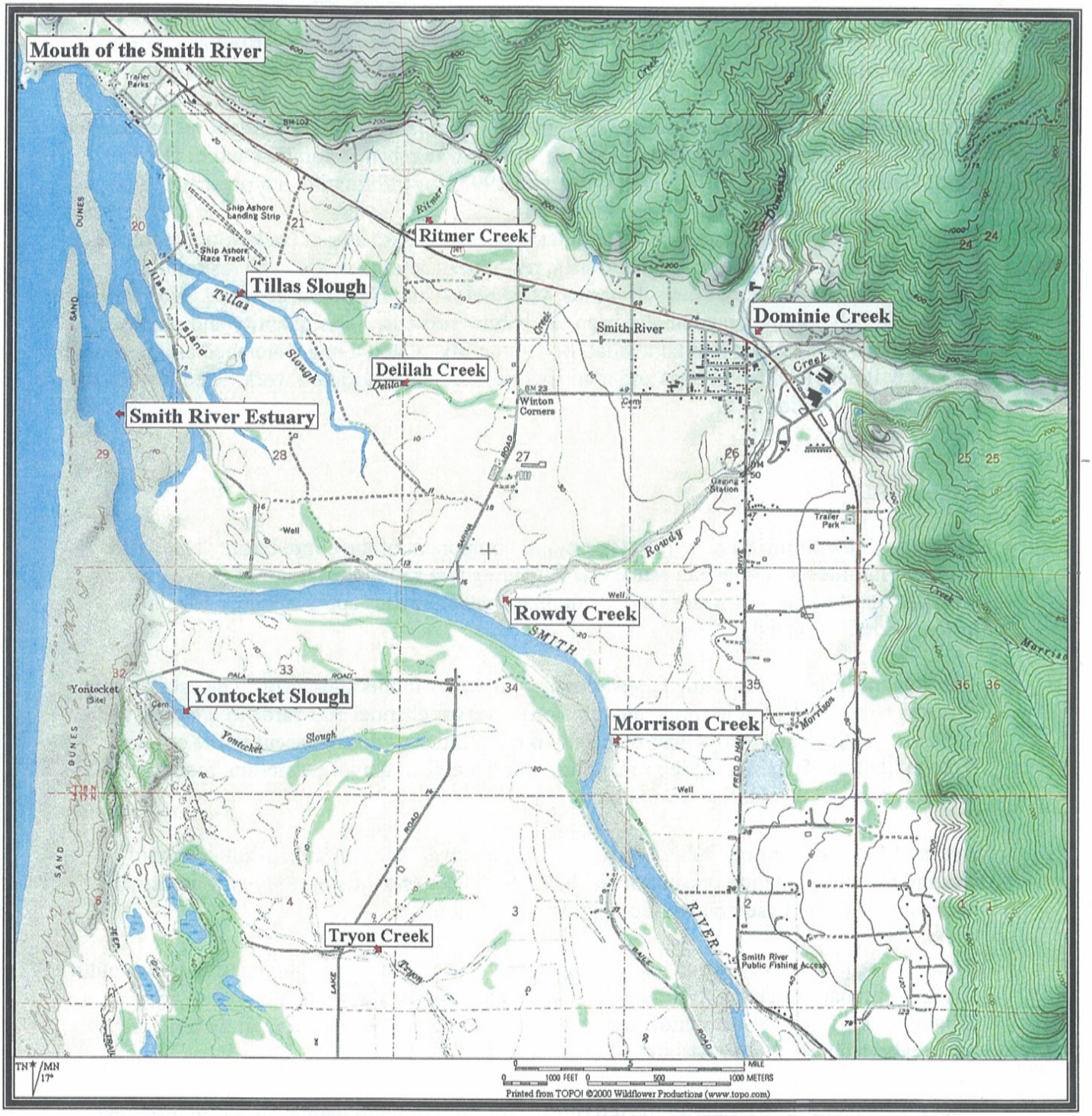

Figure 2. The Lower Smith River, from the estuary upstream to public boat launching facility on Fred Haight Drive

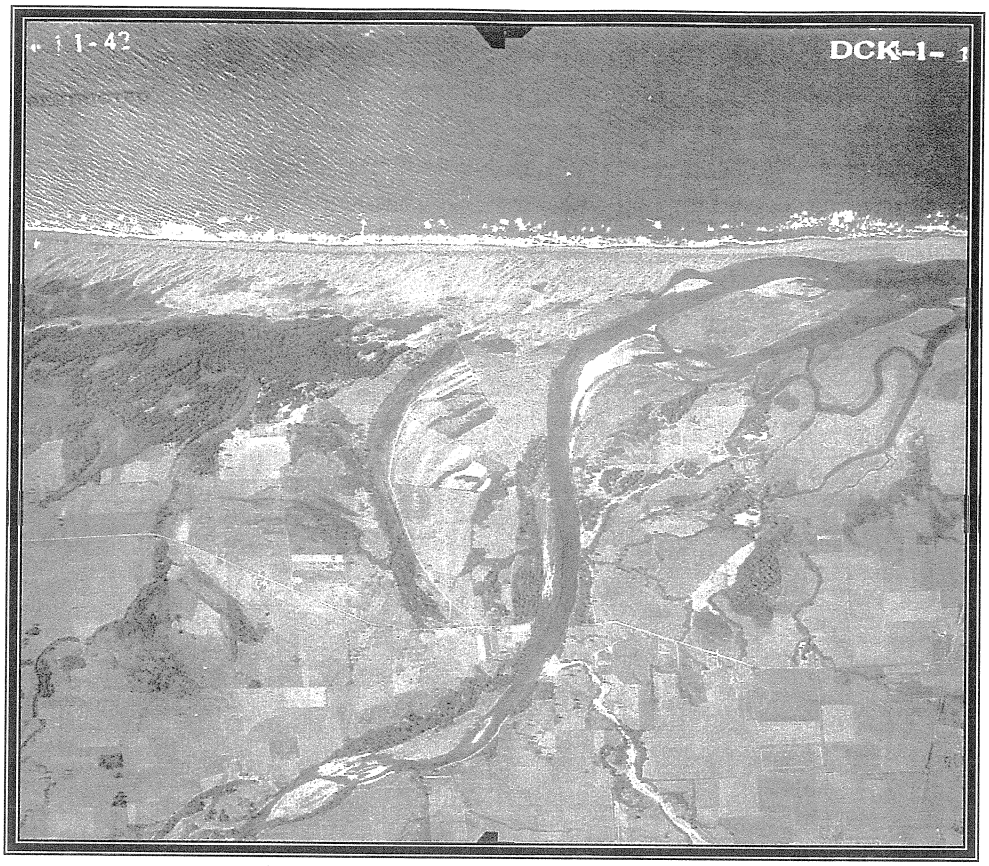

Plate #6. Aerial view of the Smith River Estuary, circa 1942.

Estuary Sloughs
(Figure 2)

- Background: estuary sloughs include Tillas Slough, Yontocket Slough and one unnamed slough. Tillas Slough is approximately two miles long, with tide gates located ¼ mile from the main estuary. The unnamed slough lies ¼ mile west of Tillas Slough and is entirely open to the ebb and flow of the estuary. Yontocket Slough is over 1.5 miles long and enters the estuary from the south. Tillas and Yontocket Sloughs are in privately managed land, except for the lowest portion of Yontocket Slough, which is managed by California State Parks. The overall contribution to Smith River salmonid production from the sloughs is unknown.

- Issues of Interest: Aleutian goose population effects on water quality; non-point source pollution from agricultural operations; changes in slough habitat and effects on salmonid estuarine rearing; tidal flow patterns and water exchange; non-native vegetation intrusion, notably canary grass.

- Actions Needed: Survey sloughs for fish species presence; document riparian and aquatic habitat conditions; evaluate water quality; canary grass management.

- Accomplishments and Restoration Activities: habitat analysis on Yontocket Slough (Scriven pers. com. 1998).

Estuary Tributaries
(Figure 2)

- Background: five streams flow into the estuary: Rowdy, Ritmer, Delilah, and Tryon Creeks, and one unnamed creek. The two streams with documented anadromous fish use are Tryon and Rowdy Creek (Rowdy Creek is discussed in its own section below). Tryon Creek flows into Yontocket Slough through residential and agricultural land. The lowest portion of Tryon Creek flows subsurface during the dry season. Tryon Creek is a historic coho stream, but impassable culverts currently block anadromous fish access. Tryon Creek supports a presumably resident population of coastal cutthroat trout.

  The other three streams have not been surveyed for fish presence and their anadromous production potential is unknown. Ritmer Creek is about 3.5 miles in length, with one mile flowing through mainly agricultural land on the Smith River Plain. Two square miles of its foothills are managed for timber production. Delilah Creek is an intermittent tributary over 1.5 miles in length, with a small lake near its headwaters. Ritmer and Delilah Creeks flow into Tillas Slough and essentially dry up during the summer months. Residential sites are interspersed in the transition between the Smith River Plain and the foothills. The one unnamed tributary is approximately ½ mile long and flows into the estuary near a private landing strip.

- Issues of Interest: Flow and temperature regimes; amount of available habitat for salmonids; condition of riparian and aquatic habitat; canary grass intrusion.

- Actions Needed: Document presence/distribution of salmonids; survey riparian/aquatic habitats; evaluate water quantity and quality; fish habitat restoration; canary grass management.

- Accomplishments and Restoration Activities: Tryon Creek: riparian planting; stream channel restoration project; evaluation of road crossings and culverts; culvert replacement and removal.

Rowdy Creek
(Figure 2)

- Background: the Rowdy Creek watershed is a major producer of salmon and steelhead in the Smith River basin, with over 23 stream miles of anadromous habitat (Table 2). Rowdy Creek has a confluence with the Smith River near the upper extent of saltwater intrusion. The lower ¼ to ½ mile of Rowdy Creek typically flows subsurface during summer months.

  The watershed is approximately 33 square miles with the land ownership predominantly private. The USFS, however, manages most of Copper Creek and sections of the headwaters of Rowdy and Savoy Creeks are contained in the Smith River NRA. Approximately one square mile of the Rowdy Creek headwaters is located in Oregon.

  Rowdy Creek, which flows through the town of Smith River, is in the heart of Del Norte County agricultural lands. The lower two miles of Rowdy Creek are managed for agriculture, cattle production and gravel extraction (Del Norte County site). Other major land uses in the basin include residential housing developments and timber production. Rowdy Creek Fish

Hatchery is located adjacent to the confluence of Rowdy and Dominie Creeks, just downstream of Hwy 101 in the town of Smith River. An old timber mill site exists along Rowdy Creek, just east of Hwy 101. Rowdy and Dominie Creeks are highly channelized near the mill site.

Table 2. Major sub-basins within the Rowdy Creek watershed.

Rowdy Creek Tributary Name	Approximate Length
Rowdy Creek (mainstem)	10 miles
Dominie Creek	4 miles
South Fork Rowdy	3 miles
Savoy Creek	2.5 miles
Copper Creek	4 miles
Total stream length (miles)	**23.5 miles**

- Issues of Interest: sediment transport in the Rowdy Creek basin; effects of gravel extraction site; grazing impacts on riparian areas; timber harvest impacts; operation of Rowdy Creek Hatchery weir; bank erosion along residential areas; restoration of the historic stream channel; salmonid production

- Actions Needed: Assess culverts, road crossings and upslope conditions; identify areas of sediment input; document the spawning density of chinook and steelhead populations relative to available habitat; conduct large woody debris inventories; implement instream structure maintenance in Rowdy and Dominie Creeks; juvenile salmonid outmigrant studies on tributaries.

- Accomplishments and Restoration Activities: a large fishery database exists on Rowdy Creek in part due to the presence of Rowdy Creek Fish Hatchery. Adult chinook, coho and steelhead runs are monitored during the hatchery trapping process. The CDFG has conducted chinook salmon spawning surveys since 1978 above and below the hatchery. Water temperature and flow measurements are taken daily at the hatchery.

  Numerous instream habitat restoration projects have been completed in the South Fork Rowdy Creek and Savoy Creek by Rural Human Services and CCC's via DFG and WCB funding (Plate #7); instream habitat projects have been placed in 2.5 miles of Rowdy Creek extending upstream from the Rowdy Creek Road bridge; a slide area was stabilized on Dominie Creek; habitat classification has been completed on most of the Rowdy Creek system; fish passage improvement at mouth of Dominie Creek; CDFG annual adult spawner counts; Humboldt State University research into the relative effects of light enhancement and carcass enrichment on growth of juvenile salmonids and their food base in South Fork Rowdy Creek and Savoy Creek; road decommissioning on Simpson Timber Company lands (Plate #8).

Plate #7. Dan Burgess anchoring a "Log-Rootwad-Boulder" instream habitat structure in South Fork Rowdy Creek, Smith River Basin.

Plate # 8. A recently decommissioned road crossing in the Rowdy Creek watershed.

Morrison Creek
(Figure 2)

- Background: Morrison Creek has a confluence with the Smith River one mile upstream from Rowdy Creek. Morrison Creek is approximately three miles in length, with a watershed size of approximately three square miles. The lower 1.5 miles of stream is bordered by agricultural land, while the upper half of Morrison Creek is managed for timber production and residential sites. A gravel extraction site exists on the Smith River bar adjacent to the creek confluence. Stream flow at the mouth of Morrison Creek goes subsurface during summer months. Fish access to/from the river is limited except during high flow events in the mainstem Smith.

- Issues of Interest: effects of cattle and elk herd access to stream banks; fish access to/from mainstem Smith River; habitat availability for salmonids.

- Actions Needed: survey stream for salmonid presence/distribution; assess available habitat for salmonids; improve fish migration access at mouth; improve fish passage and stream habitat in upper Morrison Creek.

- Accomplishments and Restoration Activities: fencing of the riparian zone; development of riparian habitat in lower creek; placement of a bridge for cattle crossing.

Hutsinpillar Creek
(Figure 3)

- Background: This 1.5-mile long stream is the first tributary to enter the Smith River upstream of the Dr. Fine bridge (Hwy 101) and drains approximately two square miles of steep forested land. The majority of this subbasin is managed for private timber production. This stream has extensive large woody debris material. Residential sites exist near the stream mouth (south of Hwy 197) with water extraction units. Summer flows are less than 5 cfs, but provide cool water to the Smith River. This small stream may provide some limited rearing habitat for juvenile steelhead or cutthroat trout.

- Issues of Interest: Habitat availability/access for salmonids.

- Actions Needed: Determine fish presence and habitat availability; assess culverts for fish passage.

- Accomplishments and Restoration Activities: None at present.

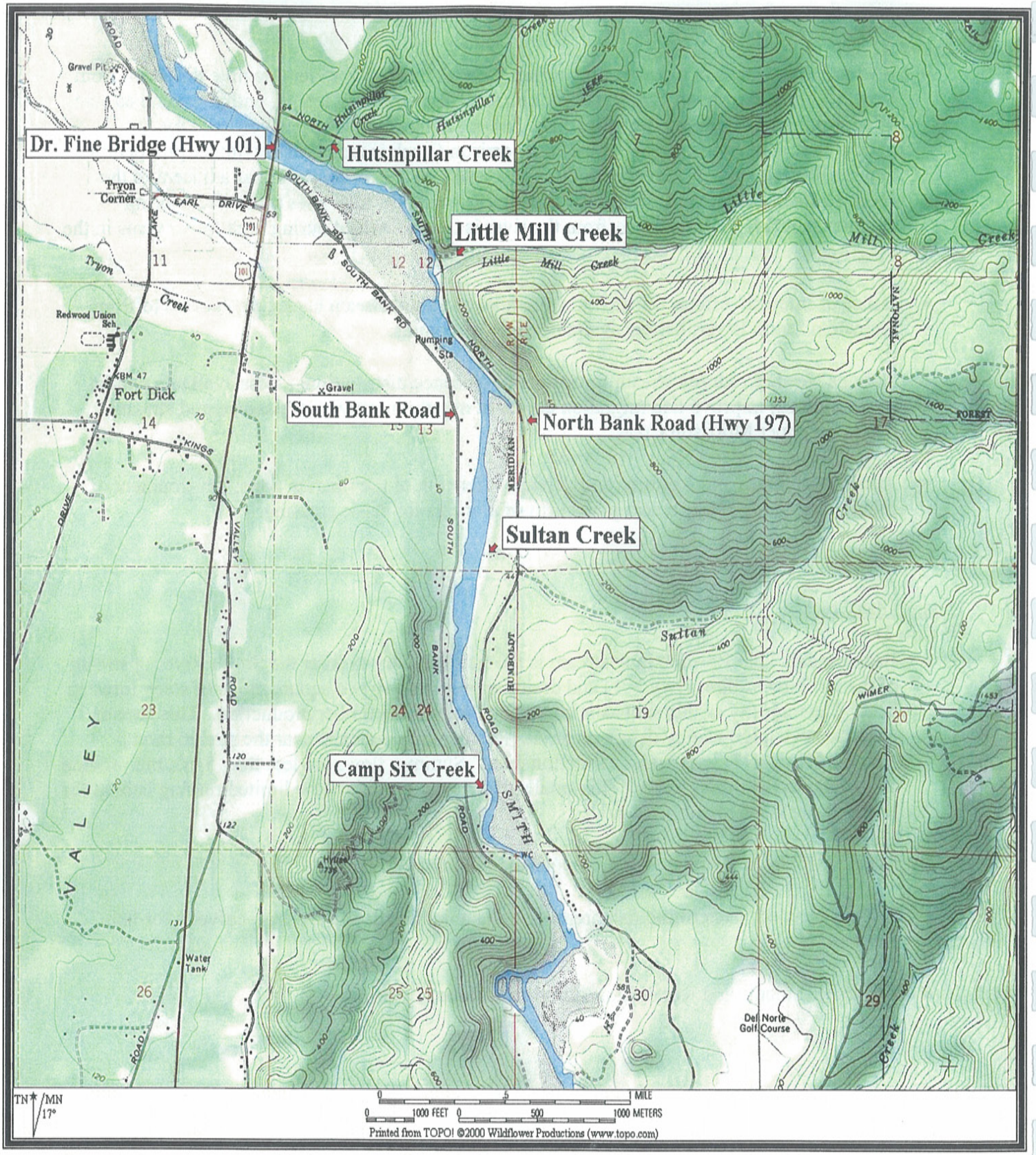

Figure 3. The Lower Smith River, from Dr. Fine Bridge upstream to Camp Six Creek.

Little Mill Creek
(Figure 3)

- Background: This tributary enters the Smith immediately upstream of Hutsinpillar Creek. Little Mill Creek is approximately three miles in length and drains about 3.5 square miles. The USFS manages 1/4 mile of the headwaters (in the Smith River NRA), with the remainder of the basin currently managed for private timber production. One residential site exists on the west side of this stream. This steep stream hosts coho and chinook salmon; however, its channel gradient is better suited to steelhead and resident trout.

- Issues of Interest: upslope sediment sources; compacted stream gravels; English ivy intrusion in riparian zone.

- Actions Needed: evaluate fish passage at culverts and road crossings (Plate #11); conduct upslope assessment work; survey for salmonid presence/distribution; quantify available habitat for salmonids; improve areas of compacted gravel; treatment of English ivy growth.

- Accomplishments and Restoration Activities: some instream habitat structures (cover logs) have been placed; streambank stabilization and fish passage barrier modification (debris jams) have occurred in the lower 2.5 miles of creek; Humboldt State University research into the relative effects of light enhancement and carcass enrichment on growth of juvenile salmonids and their food base.

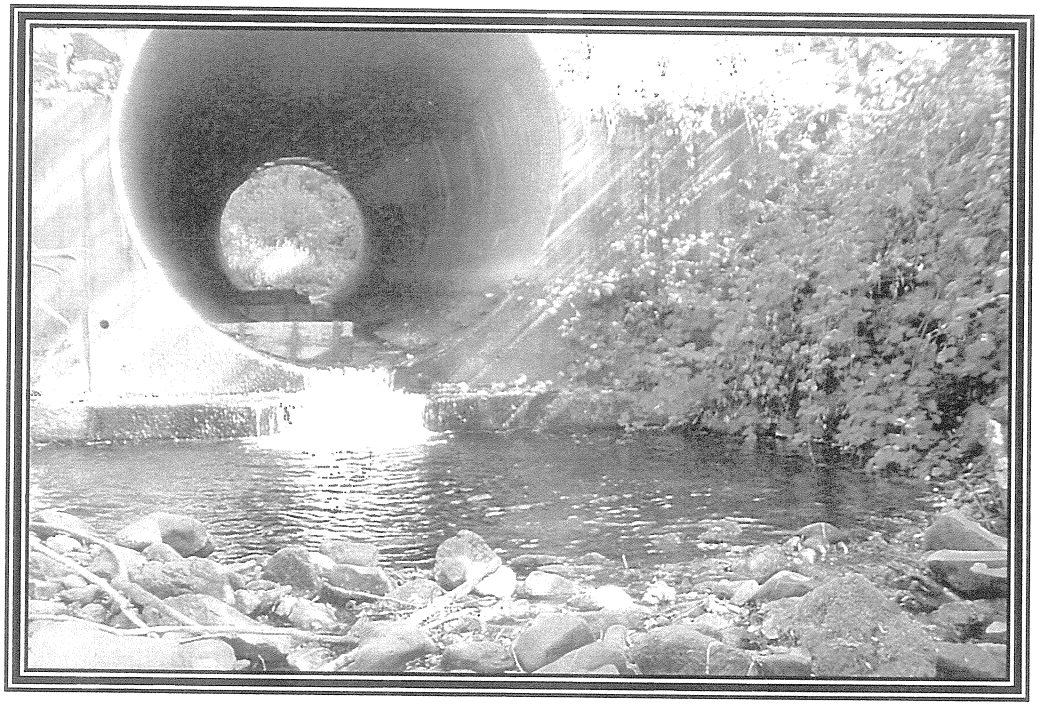

Plate #9. Downstream view of culvert carrying Little Mill Creek flow underneath Hwy. 197.

Sultan Creek
(Figure 3)

- Background: Sultan Creek is over two miles in length and drains approximately three square miles of privately owned lands. Stream flow at the mouth of Sultan Creek goes subsurface in the summer. This subbasin has been managed for timber production for many decades. Sultan Creek annually supports juvenile cutthroat, steelhead, chinook and the occasional coho salmon. A gravel extraction site exists on Sultan Bar, downstream of the of the Sultan Creek confluence with the mainstem Smith River.

- Issues of Interest: Habitat availability for salmonids; fish access at the confluence with the Smith and through highway and timberland culverts.

- Actions Needed: Survey available habitat; document fish presence/distribution; evaluate fish access through culverts at Hwy 197 and private timberland culvert 500 ft. upstream from Hwy 197; instream structure monitoring for maintenance.

- Accomplishments and Restoration Activities: spawning surveys for chinook by private landowner (1984-2000); instream structure placements (boulder weirs and boulder-log cover structures) within ¼ mile of Hwy 197 culvert (1990-1997) by Rural Human Services; CDFG salmonid population index study reach.

Camp Six Creek
(Figure 3)

- Background: Camp Six Creek flows through county culverts under South Bank Road and enters the Smith River from the west, one mile upstream of the mouth of Sultan Creek. This steep stream is 1.5 miles long, drains approximately one square mile and is entirely in private ownership. Timber production is the main resource use in this drainage.

- Issues of Interest: habitat availability/suitability for salmonids; fish passage through culvert.

- Actions Needed: survey stream for fish species presence; assess South Bank Road culvert for fish passage; quantify available salmonid habitat; evaluate riparian and aquatic habitat.

- Accomplishments and Restoration Activities: none to date.

Peacock Creek
(Figure 4)

- Background: Peacock Creek is three miles in length and drains a 2.5 square mile watershed. The majority of this watershed is in private ownership and a portion of the headwaters is managed by the USFS. Lower Peacock Creek flows through California State Park land. This stream annually supports steelhead and cutthroat trout, with periodic coho and chinook salmon presence. Stream flow at the mouth becomes subsurface each summer. A residential community and a golf course are established along Peacock Creek and an additional subdivision of homes is currently being built. The Tan Oak Drive community has created its own water district and utilizes well systems for its water sources. The headwaters of Peacock Creek are steeply sloped and managed for timber production and residential development.

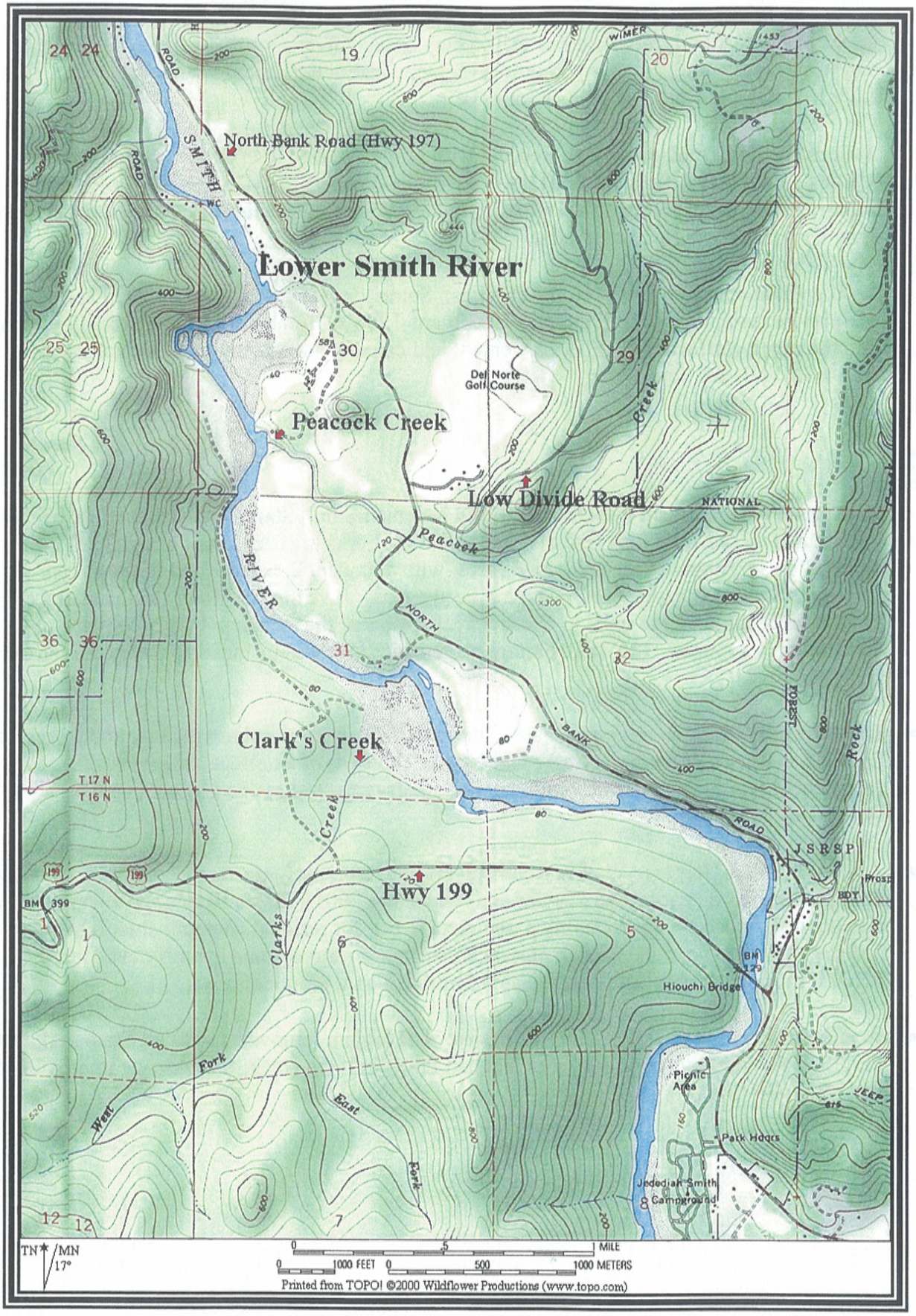

Figure 4. The Smith River, from Camp Six Creek upstream to Jedidiah Smith Campground.

- Issues of Interest: migration barrier at Tan Oak Drive culvert; water quality and quantity during summer months; water withdrawal rights; construction of housing development above Hwy 197; habitat availability for salmonids.

- Actions Needed: replace culvert crossing with properly-sized arch culvert on footings or a bridge (Taylor and Associates 2001); work with landowners to evaluate effects of water withdrawal on anadromous fish populations; survey for fish species presence and distribution; quantify aquatic and riparian habitat.

- Accomplishments and Restoration Activities: Some log jam removal in the 1980's; 4-H in-stream structure placement: jump pool at culvert -1980's; Humboldt State University research into the relative effects of light enhancement and carcass enrichment on growth of juvenile salmonids and their food base.

Clarks Creek
(Figure 4)

- Background: This stream lies entirely within Jedediah Smith State Park. The main stem is approximately one mile long and the East and West Forks are each about one mile. This stream flows through a dense redwood forest with abundant downed wood in the stream. It is a low gradient stream with gently sloping headwaters. Juvenile cutthroat, steelhead and coho have been documented to exist in Clarks Creek. Flow at the stream mouth becomes subsurface in summer. The State Park manages this sub-basin by clearing downed trees from trails and roads.

- Issues of Interest: Fish migration barrier through Walker Road culvert (Taylor and Associates 2001); fish access through the CalTrans Hwy 199 culvert; other effects of Hwy 199 (accidents/hazardous spills). Overall, habitat quality assessed as "very good"(Taylor and Associates 2001).

- Actions Needed: Replace Walker Road culvert with a properly sized arch culvert on footings, or a doublewide flatcar bridge (Taylor and Associates 2001); assess Highway 199 culvert for fish passage; measure water quality parameters to test for residual contaminants from Hwy 199 accidents/traffic; conduct fish presence/distribution surveys and quantify available habitat; improve access to/from mainstem Smith River at mouth of creek.

- Accomplishments and Restoration Activities: 4-H logjam removals (1980's); State Parks also modified several large redwood trees that had fallen into the creek; fish passage improvement project (1998-'99).

Mill Creek
(Figure 5)

Background: Mill Creek is one of the most productive tributaries for salmon and steelhead in the entire Smith River watershed. All species of salmonids present in the Smith basin can be found in Mill Creek. The main tributaries to Mill Creek include West Branch Mill, East Fork Mill, and Bummer Lake Creek. Numerous first and second order tributaries feed these streams. Much of the 35 square mile basin is privately owned (timber production) with approximately ten square miles managed by Redwood National and State Parks. Save-the Redwoods League is attempting to purchase all the privately held lands through a combination of state, federal, and private funds. When this occurs, purchased lands will be integrated into the California State Park system, and the entire watershed will be converted into a state park.

- Issues of Interest: LWD recruitment; salmonid rearing and carrying capacity of system; culvert analysis; management of public lands acquired from Stimson Lumber, in particular the vast logging road network; public educational facilities.

- Actions Needed: Continue long-term data collection for the system; conduct assessment of road crossings/culverts; conduct upslope assessment work and identify priority sites for road decommissioning projects.

- Accomplishments and Restoration Activities: There is an extensive database for the Mill Creek system including: over 20 years of spawning surveys (Waldvogel 1980-2001), juvenile salmonid emigration studies (Albro 1994-present), and habitat surveys/classifications. Instream structure work had occurred and upslope assessments were completed in 1997.

- Plate #10. Coastal cutthroat trout captured at outmigrant fish trap, East Fork of Mill Creek.

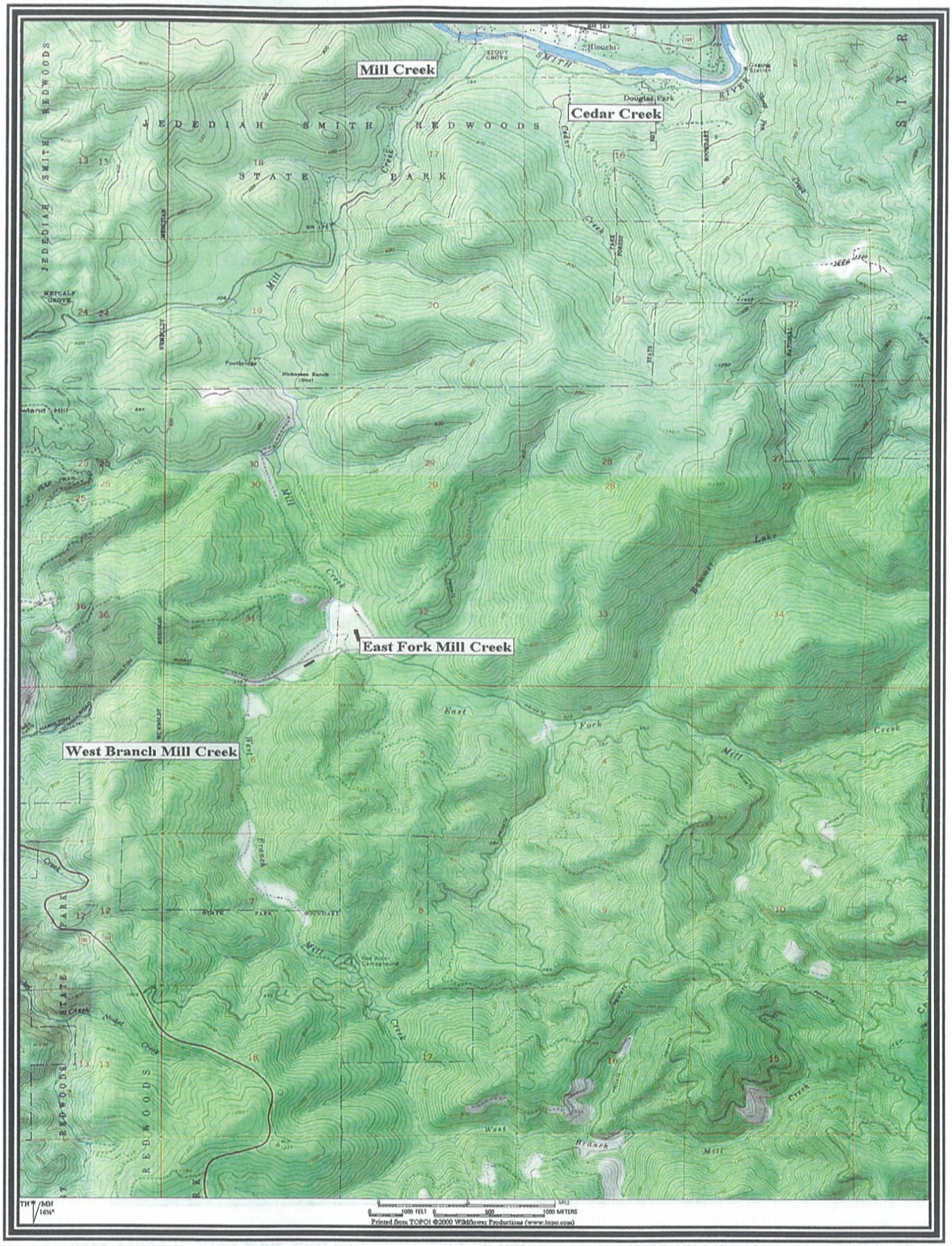

Figure 5. Location of Mill Creek and Cedar Creek, Smith River tributaries, California.

Cedar Creek
(Figure 5)

- Background: Cedar Creek is approximately two miles in length and drains about two square miles within Redwood State and National Parks. The lower reach of stream contains good habitat for anadromous spawning and rearing, while the upper half of the stream is moderately steep. Cedar Creek periodically hosts chinook and coho salmon and annually receives a run of steelhead and cutthroat trout. Park management in this stream focuses upon clearing roads and trails of fallen trees. The private land in the headwaters of Cedar Creek is managed for timber production.

- Issues of Interest: Habitat availability for spawning salmonids (marginal substrate); fish passage through culverts.

- Actions Needed: Survey for fish species presence/distribution; assess available habitat; evaluate fish passage through Douglas Park Drive culverts.

- Accomplishments and Restoration Activities: original fish passage improvement through the Douglas Park Drive culvert (This work occurred in the 1980's and needs to be re-evaluated).

Rock Creek
(Figure 6)

- Background: Rock Creek flows into the South Fork Smith River nearly 11 miles upstream from the confluence with the mainstem. This stream contains 11.8 miles of fish bearing habitat with numerous first and second order tributaries. The Rock Creek watershed drains almost 15 square miles, with three square miles managed by the USFS (contained in the SRNRA); the remainder is privately owned timberland. These privately held lands are included in the pending Mill Creek land acquisition. Steelhead, cutthroat trout and chinook utilize this drainage. One juvenile coho salmon was observed approximately ½ mile upstream of the mouth in 1995 (Scriven, pers. com. 1995). The lower half of this stream is "gravel poor", thus the majority of spawning occurs in the upper half of Rock Creek. A small residential community exists near the mouth of Rock Creek and an old mining claim exists ½ mile upstream of the stream mouth.

- Issues of Interest: Extent of anadromy in upper watershed; spawning habitat availability for salmon; sediment transport in system.

- Actions Needed: Assess stream and riparian habitat conditions and availability for salmonids throughout system; conduct upslope assessment work to identify sediment input sources.

- Accomplishments and Restoration Activities: Spawning surveys and juvenile salmonid presence surveys conducted since 1995.

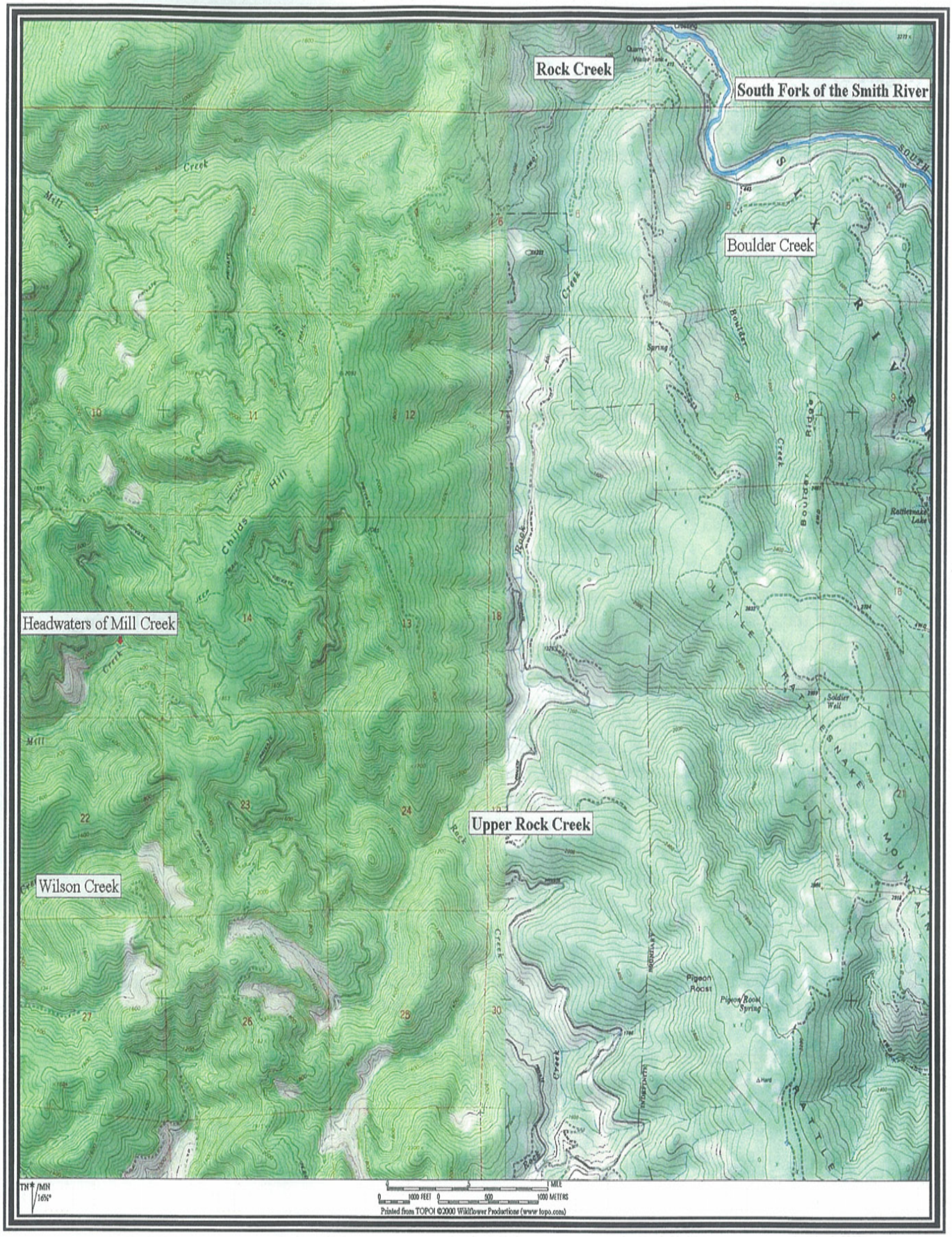

Figure 6. Location of Rock Creek, tributary to the South Fork of the Smith River, California.

Goose Creek

- Background: Goose Creek is the largest tributary to the South Fork Smith River. It drains approximately 40 square miles with ownership roughly split between private holdings and the USFS (Smith River NRA). The main tributaries are the East and West Forks of Goose Creek with numerous first and second order streams. Timber harvest has occurred for decades in this system and continues to be a primary land use in the watershed. Chinook salmon, steelhead and cutthroat trout utilize the system.

- Issues of Interest: extent of timber harvest activity and associated road network; habitat availability and extent of utilization by salmonids.

- Actions Needed: Conduct upslope assessment work (including road crossings and culverts) to identify sources of sediment input; quantify available habitat and determine fish access to the upper watershed; document adult and juvenile salmonid presence/distribution.

- Accomplishments and Restoration Activities: Some instream structure work (USFS).

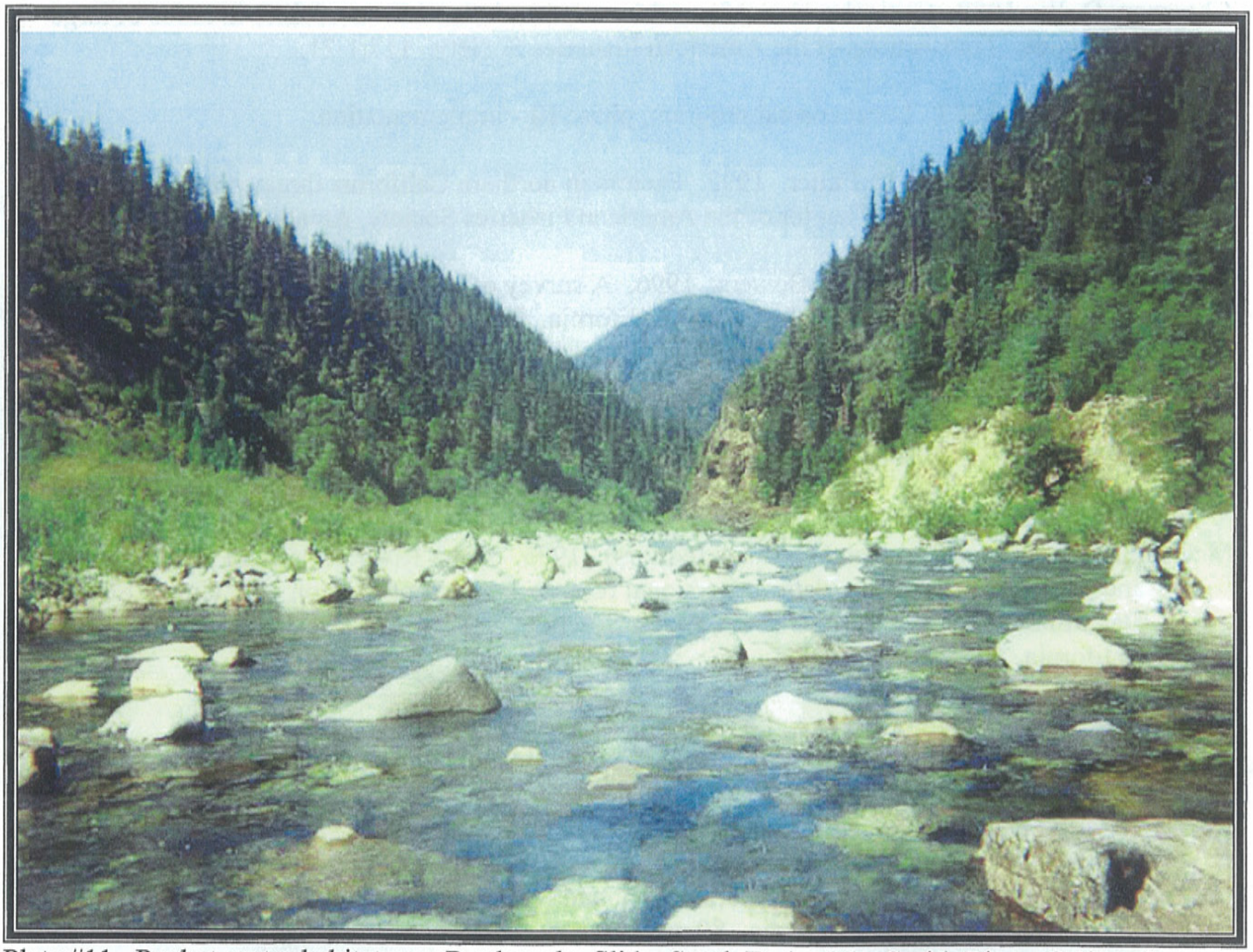

Plate #11. Pocket-water habitat near Rattlesnake Slide, South Fork of the Smith River, California.

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Waldvogel, Jim. 1997-2001. SeaGrant advisor, University of California-Davis Cooperative Extension. Crescent City, CA

Will, Bob. 1998. Manager, Rowdy Creek Fish Hatchery, Smith River, California.

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Appendix A: SMITH RIVER COMMUNITIES INPUT

Appendix A details and summarizes relevant community input gathered during the 2001 public meeting process, including feedback from the take-home survey forms (Figure A-1). The community meetings held during August 2001 in Gasquet and Smith River were successful in obtaining public involvement (over 60 people attended) and identifying issues important to each community. Turnout was light, however, at the September 20th 2001 meeting in Crescent City, which coincided with a major presidential address following the terrorist attacks of 9/11.

- Gasquet public meeting: a majority of comments were related to water quality issues in general, with chemical use in the Smith River basin being a primary concern. Specifically, residents would like to see greater detail regarding quantities of each chemical used, how each chemical is used, and details on monitoring programs already in place. Certain individuals would support a wholesale banning of chemical use basin-wide. Other suggestions were made that emphasize needs to be placed on the education of homeowners about chemical use as related to river friendliness. Concerns were also raised about emergency response time to toxic accidents along the river because of its remote location. It was suggested that community awareness should be raised regarding response to a hazardous spills.

  There were also comments regarding format, editorial, and organizational changes to the plan. Residents' suggestions included: 1) SRAFAP address the entire basin rather than be focused on private lands in the lower river; 2) particular SRAFAP sections should be organized alphabetically to allow easy reference; 3) provide an executive summary at the beginning of the document; 4) the word "anadromous" be dropped from the SRAFAP title to avoid confusion over its meaning; and 5) all information be presented in a balanced and impartial manner.

- Smith River public meeting: residents in Smith River were vocal regarding their worries of potential economic effects resulting from the Action Plan. In particular, concerns were raised that the SRAFAP would result in new regulations/restrictions placed on landowners and that this document would be used to promote an "extreme environmental agenda." There were also strong sentiments that state and federal regulatory agencies need to reach out to communities and use local knowledge as a resource when formulating management strategies. Comments were also made that the SRAFAP should be balanced in its approach with recommendations based on the best available science.

- Crescent City public meeting: Turnout was limited due to the aftermath of the 9/11 terrorist attacks. Several issues were raised by those in attendance and included: 1) concerns that regulatory agencies negatively affect grassroots watershed restoration efforts from intense and costly review processes; 2) comments that the USFS should be encouraged to parallel the SRAFAP objectives on tributaries that drain federally owned lands; and 3) questions regarding the future status of the ESA listing for coho in the Smith River.

- Questionnaire: a total of 17 completed survey/questionnaires were returned in the weeks following the public meetings and have provided interesting comments and useful suggestions. A comment that was repeated in several of the returned questionnaires related the relatively healthy state of the Smith River and its fisheries to the management practices of the gravel, agriculture and timber industries over the past 60 years.

Figure A1. Take-home outreach survey form distributed during public involvement process, 2001.

SMITH RIVER ANADROMOUS FISH ACTION PLAN QUESTIONNAIRE, Part I

The Smith River Advisory Council is in the process of preparing the Smith River Anadromous Fish Action Plan. Please take some time to fill out this questionnaire to help us identify important issues facing anadromous fish in the Smith River.

Do you reside within Del Norte County Yes_____ No_____

Personal Uses of The Smith River watershed

Place an X in all spaces that apply

A) _____ Recreation such as sport fishing, hunting, hiking, kayaking
B) _____ River guiding for fishing or rafting
C) _____ Industry income (agricultural, logging, gravel extraction, mining, agency employment)
D) _____ I do not currently use natural resources associated with the Smith River
E) _____ Other (please describe) _____

_____

_____

Management considerations for Smith River's Anadromous Fish

What topics do you consider the most important in "managing the anadromous fisheries" of the Smith River? Please number in their order of importance to you , with Number 1 being the most important:

A) _____ Recreation (sport fishing, etc)
B) _____ Maintaining high water quality in the mainstem Smith River
C) _____ Restoring fish habitats and fish runs in Smith River tributaries
D) _____ Maintaining jobs and income associated with natural resource extraction
E) _____ Environmental pollution from toxic spills (highways), chemical use
F) _____ Other (list): _____

_____

QUESTIONNAIRE, Part II

Identification of Sub-Basin Issues

If you are familiar with any Smith River sub-basins (tributaries) and know of specific issues faced by anadromous fish (barriers, slides, poaching, etc), please describe below.
Please include Smith River tributary name, identified issue, and location (approximate) if applicable.

Comments

If you have additional concerns related to anadromous fish in the Smith River that have not been identified above, please use the space below/back of sheet.

OPTIONAL

Name:
Occupation or Title:
Address:
Email address:

Thank you for helping us write the Smith River Anadromous Fish Action Plan.

A particular user group (professional fishing guides) did not respond during this process simply because they are out of the area at the time of year when the meetings were held (late summer). As a result, survey responses regarding sport fishing issues on the Smith were very limited. This bias is shown in Figure A-2 that summarizes identified personal uses of the River (e.g.: "fishing" as category received zero responses).

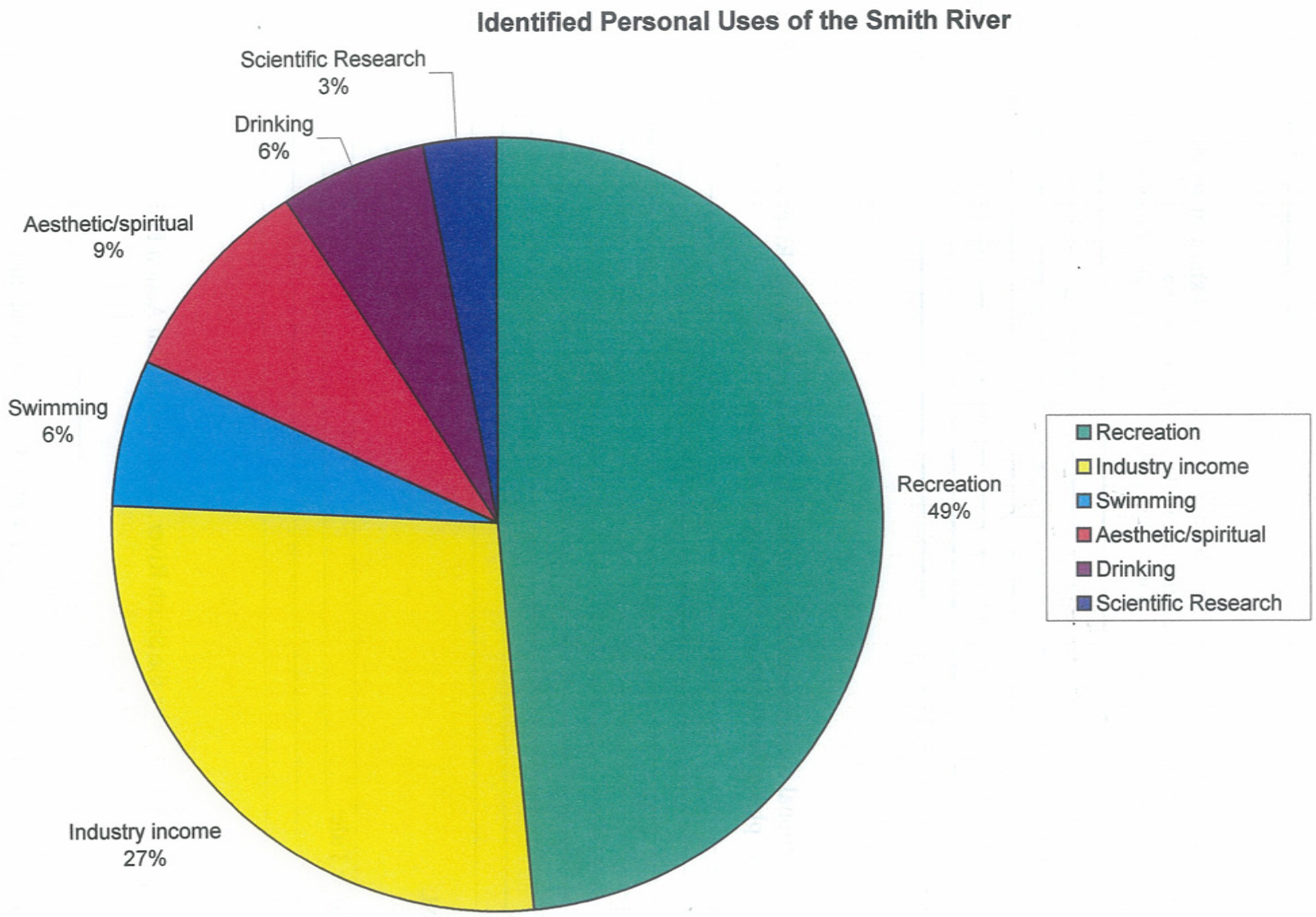


Figure A2. Identified Personal Uses of the Smith River, from returned Smith River Anadromous Fish Action Plan Questionnaires (n=17), late-summer 2001.

Appendix B: HUMAN HISTORY OF THE SMITH RIVER BASIN

The native inhabitants in the Smith River basin are the Deeni, a group of speakers of an Athabascan language whose territory ranges north from Wilson Creek to the Sixes River in Oregon. The Deeni who inhabited the Smith River basin were named by settlers as the Tolowa people. Those Deeni of the Chetco River basin were named the Chetco, and those of the Rogue River basin were named the Tututni. It is estimated that the historic population of the Tolowa was around 3,300 people inhabiting 25 towns and villages within the Smith River basin.

The majority of the Tolowa lived in coastal towns, with smaller villages located inland on the banks of the Smith River. A distinct territory surrounding each town or village was managed by the people to optimize resource collection. Gathering camps within that surrounding territory were seasonal in nature and coincided with local fluctuations in the abundance of smelt, anadromous fish, game, seaweed, and other resources.

The two major towns located nearest to the Smith River were Yontocket and Howonquet. Yontocket, located south of the mouth of the Smith River, was considered to be the center of the world and the site of genesis. Howonquet was located immediately north of the mouth of the Smith River.

Removal and massacres both divided and reduced the number of Tolowa who survived into the 20th century. The majority of Tolowa who persevered were moved north to Siletz River or south to Hoopa Reservation at the end of the 19th century. Since the relocation effort, many Tolowa have returned to the traditional homeland of their people.

Currently, the Tolowa people are organized into two Tribal governments: 1) the Tolowa of the Smith River Rancheria number nearly 900 individuals and have a 200-acre Rancheria at Howonquet; and 2) Elk Valley Rancheria, comprised of Tolowa and Yurok Tribal members, owns 450 acres and has a Rancheria in southeast Crescent City. There remains another body of Tolowa people seeking separate Federal acknowledgement and these families refer to themselves as the Tolowa Nation. This group comprises some 40 members, does not hold trust lands and is not currently federally recognized by the United States government.

The Tolowa of the current era utilize the Smith River estuary and the surrounding areas for subsistence fishing, hunting and resource collection. They continue to practice traditional ceremonies, including those associated with the renewal of important resources (the river, the mountains, the ocean, game, plants, etc.) reminding them of their relationship and responsibilities to creation.

In 1828, the expedition led by Jedidiah Smith found the river that bears his name. The large influx of European settlers did not occur until over 20 years later when gold was discovered in the Trinity River in 1848. Hundreds of gold prospectors entered the watershed and businesses were created to support their needs. Towns were built and a cannery and farms were established by the 1880s. Other minerals were mined, but gold was the primary attraction that brought miners. Mineral extraction was the primary income source for residents in the basin for many years. Declines in the demand for chromite, copper and other minerals changed local mining to a more recreational activity. Currently only a handful of suction dredge mining claims are actively worked in the Smith River National Recreation Area (SRNRA).

The population centers in the Smith River basin are Crescent City (8800), Smith River (2000), Gasquet (700), with smaller rural communities scattered throughout the watershed. The main industries in the basin today are: timber production, lily bulbs, sport fishing, beef and dairy cattle ranching, gravel extraction, tourism and other recreational activities.

Timber harvest became the next industry that created jobs in the area. Initially steam donkeys, railroads and skid trails along streams were the methods used to move logs to the lumber mills. It was not until after World War II that timber harvest really boomed. With the advent of large tractors came the ability to harvest trees faster. The demand for lumber and housing throughout the nation increased dramatically. Hundreds of millions of board feet were harvested per year, with minimal consideration for the condition of the streams or habitat that supported the fish and wildlife. The legacy from past timber harvest practices (with little regard for ecological considerations) can still be seen where clear cuts went to the streambed and mixed conifer/hardwood riparian forests were replaced by an alder-dominated riparian zone. Environmental controversy over the methods and quantity of timber harvest became big issues. Changes in the California Forest Practice Rules in 1973 prohibited clear cuts into fish-bearing streams. By the end of the 1980's timber production had decreased sharply, while at the same time, timber harvesting methods were being improved to protect sensitive species and their habitats. Since the 1980's, logging in the SRNRA has continued to diminish, and the timber industry is no longer the dominant economic sector in the area.

The prime agricultural land in the basin exists on the Smith River Plain. Currently it supports a multi-million dollar lily bulb industry, beef and dairy cattle ranching, and hay production. Levees were constructed in order to increase the amount of land that could be consistently farmed. Construction of the levee system which occurred in the 1950's controls the northeastern portion of the river from its lower seven miles to the river mouth. Agricultural production has not experienced dramatic declines similar to those of the timber industry.

The fishing industry in the basin revolves around anglers and fishing guides. In 1980 the fishing industry in the Smith River was valued at $3.8 million by the Six Rivers National Forest (CDFG 1980). The large steelhead and chinook caught contribute to the success of the river guides and support businesses. The prime fishing season begins about when the summer tourist season ends. In the fall and winter months anglers travel hundreds of miles to fish the Smith River. Many guides rely upon the Smith for the majority of their business. In summer months fishing mainly consists of tourists targeting juvenile salmonids (which are often referred to as "trout").

Appendix C: **LIST OF FISH SPECIES FOUND IN THE SMITH RIVER**

Figure C1. Fish species inhabiting the Smith River (Monroe et al. 1975, Mizuno personal communication 1995, Waldvogel personal communication 1997).

Common name	Scientific name
Steelhead	*Oncorhynchus mykiss*
Chinook Salmon	*Oncorhynchus tshawytscha*
Coho Salmon	*Oncorhynchus kisutch*
Sockeye Salmon	*Oncorhynchus nerka*
Chum Salmon	*Oncorhynchus keta*
Coastal Cutthroat trout	*Oncorhynchus clarki clarki*
Coastrange sculpin	*Cottus aleuticus*
Prickly sculpin	*Cottus asper*
Pacific Staghorn sculpin	*Leptocottus armatus*
Sharpnose sculpin	*Clinocottus acuticeps*
Green sturgeon	*Acipenser medirostris*
Klamath smallscale sucker	*Catostomus rimiculus*
Pacific lamprey	*Lampetra tridentata*
Brook lamprey	*Lampetra spp.*
Bay pipefish	*Syngnathus leptorhynchus*
Threesine stickleback	*Gasterosteus aculeatus*
Tidewater goby	*Eucyclogobius newberryi*
Saddleback gunnel	*Pholis ornata*
Surf smelt	*Hypomesus pretiosus*
Topsmelt	*Atherinops affinis*
Jacksmelt	*Atherinopsis californiensis*
Eulachon	*Thaleichthys pacificus*
Pacific herring	*Clupea harengus pallasi*
Northern anchovy	*Engraulis mordax*
English sole	*Pleuronectes vetulus*
Sand sole	*Psettichthys melanostictus*
Starry flounder	*Platichythys stellatus*
Black rockfish	*Sebastes melanops*
American shad	*Alosa sapidissima*
Redtail surfperch	*Amphistichus rhodoterus*
Shiner surfperch	*Cymatogaster aggregata*
Striped surfperch	*Embiotoca lateralis*

Appendix D: **SMITH RIVER ANADROMOUS SALMONIDS**

Life Histories

Chinook Salmon

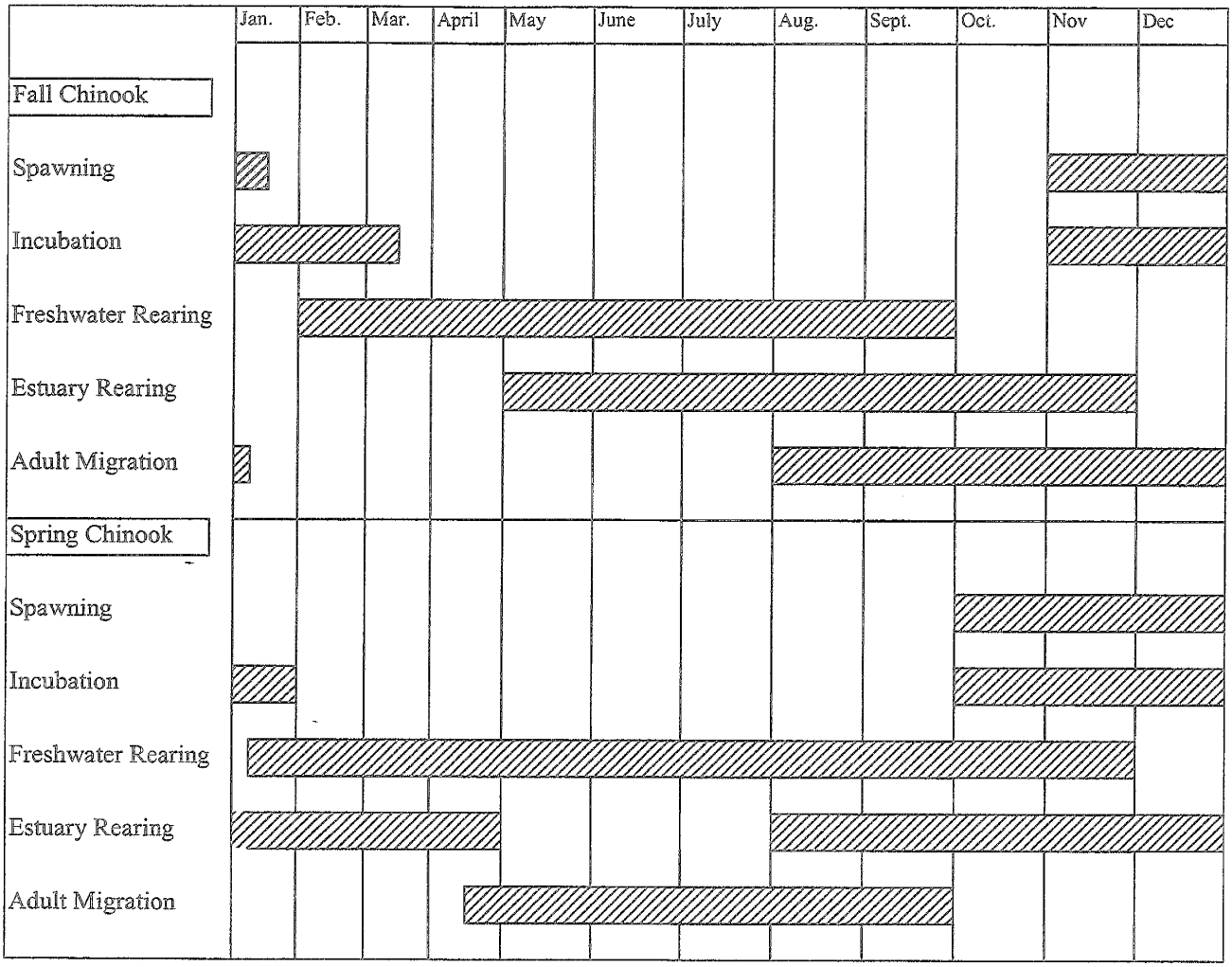
Chinook salmon are the largest salmonids in the Smith River basin. They can reach 80 lbs., but occasional chinook over 50 lbs. have been caught in the past few years. Two races of chinook (fall and spring run salmon) inhabit the basin. Typically, thousands of adult fall run fish return each year, but much less is known about the population status of "springers" in the Smith. Ages for returning adult chinook range from two to six years old. The timing for adults returning to the river is generally April-June for spring chinook and September-December for fall chinook (Figure D1). A small percentage (5 - 10%) of male chinook that return after only 1 year at sea are commonly called "jacks." Spawning typically occurs in the mainstem river and tributaries from November to February with a peak in December.

When a female has dug a redd (spawning nest) and is ready to release her eggs, the dominant or opportunistic male will hold position beside her to release the milt simultaneously (Allen and Hassler 1986). The number of eggs released by a female varies according to fish size, but average fecundity for Smith River chinook was 4100 eggs per female in 1997 (Bob Will, pers. com. 1998).

After fertilization is completed the female covers the eggs with a layer of gravel. Fertilized eggs develop for approximately 45 days before hatching. Once hatched, the "alevins" live off the nutrients in their yolk sacs for up to an additional 30 days or until the sac is absorbed. The resulting fish are called "fry" and are ready to start feeding upon exiting the gravel. The preferred rearing habitat in small streams includes pools and runs deeper than two or three feet. As chinook fry grow stronger, they move to deeper, swifter water to take advantage of better feeding positions and cover. By late spring/early summer, young of the year chinook are referred to as "parr" because of the bar shaped "parr" marks along their sides.

As parr begin to migrate downstream from their natal tributaries, their characteristic marks slowly fade as they undergo the smoltifcation process (preparing for entry into saltwater). As they get closer to the estuary, the fins attain a smoky black color, and the sides of the fish turn silvery. Internally the kidneys undergo a change to prepare for a reversal in osmoregulation. The estuary provides a transition or buffer zone for the chinook "smolts" to prepare for life in saltwater. Chinook smolts will typically range in size from 90 to 120 mm forklength. The average amount of time spent rearing in the Smith River estuary is not known, but size at ocean entry seems to play a key factor in the fish's ability to survive to adulthood. Smaller fish tend to incur high mortality rates. Cover from predators and food availability are two factors that influence estuarine rearing time. A small number of chinook parr will not emigrate to the ocean until after spending one winter in freshwater and these fish will typically be larger than those fish that emigrated the previous year (>120 mm forklength). It is thought that this small number of yearling emigrants represents the progeny of spring-run fish (Jason White, pers. com. 1995).

Figure D1. Life history patterns of chinook salmon in the Smith River.



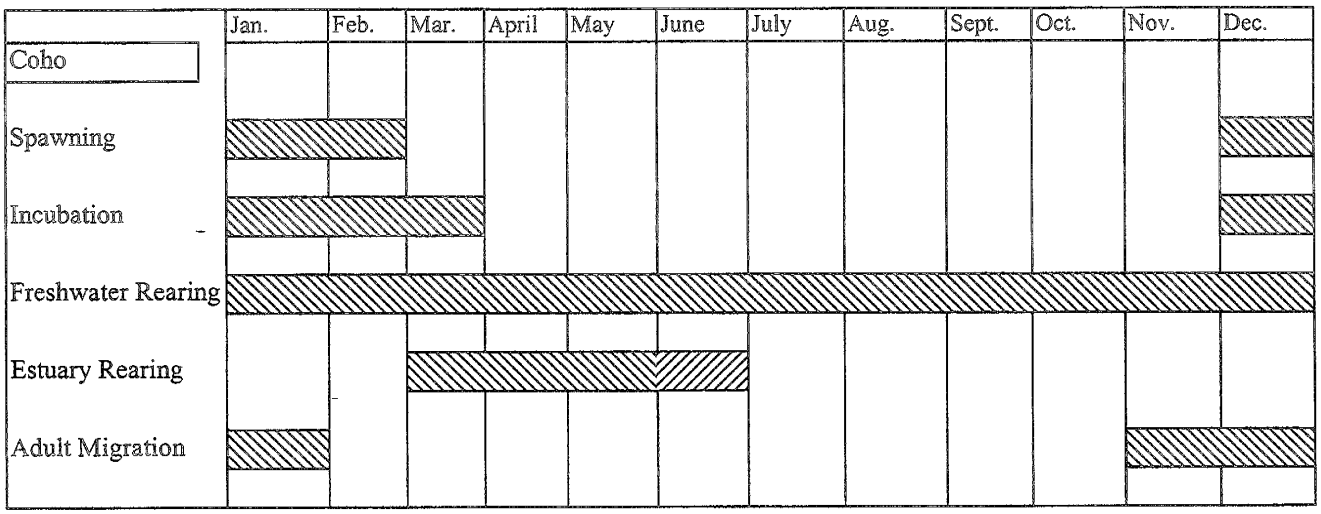
Once at sea, juvenile chinook migrate in large schools and feed almost continuously, maintaining very high growth rates. Upwelling of nutrients in the ocean influences food availability and hence ocean growth and survival. In addition, mortality from marine mammals, fish, birds and human fishing efforts directly influences the number of adult salmon that return to the river to spawn. Chinook spend between 2 - 5 years at sea before returning to the Smith River to spawn. A majority of returning fish are 3 and 4 year olds, with some two year old jacks, and an occasional 5 or 6 year old fish.

Coho Salmon

Coho salmon are not as numerous or as widely distributed in the Smith River basin as chinook salmon. Adult fish return to the Smith River between November and January each year (Figure D2). Coho spawning is focused in two major tributaries: Rowdy Creek and Mill Creek. Several other key tributaries to the North, Middle, and South Forks of the Smith also host coho. Adults can weigh upwards of 15 pounds, but six to ten pound fish are more common. Most adult coho spend 18 months in the ocean before returning to the river as three-year old fish. A small percentage (5 to 20%) of males do return as two-year old jacks (Weitkamp et al. 1995).

Coho typically spawn in small tributaries and not in the lower main forks of the river. Some coho spawning, however, occurs in the upper South Fork Smith River (above Eightmile Creek). Egg production (fecundity) depends upon fish size. It averaged 1850 eggs per female in 1997/1998 (Bob Will, pers. com. 1998). A female will initiate the spawning ritual by beginning redd construction in a pool tail or microhabitat with suitable depth, velocity and substrate. The substrate that coho use for redds varies in size from 1/4 inch to 4-inch diameter, with embeddedness of 20% or less being ideal (Hassler 1987). Once the eggs and milt are deposited in the redd, the female will cover the eggs and guard the nest from other salmon. Adult coho die within two weeks of spawning.

Figure D2. Life history patterns of coho salmon in the Smith River.



Fertilized eggs require 35 to 50 days to hatch, dependent upon water temperature. Once hatched, the alevins absorb the yolk sac in two to five weeks before emerging from the redd as fry. Fry emerge from redds from February to May and migrate to the stream margins where the stream velocity is decreased. When the fry reach a length of about 50 mm (2 inches), they migrate to habitats with complex cover such as undercut banks, rootwads, large woody debris and vegetative overhangs. There they feed, grow and establish territories. Juveniles migrate upstream and downstream to occupy habitats with less competition and better food supply. They will maintain their territories throughout the summer. Compared to chinook parr, coho juveniles have taller, thinner parr marks along their sides. The distinct sickle-shaped anal fin with its white leading edge is a striking identification trait.

When the rainy season begins in the fall juvenile coho (now about 80 mm) move to areas protected from high velocities. These velocity refuges are important for the over-winter survival of coho. Some coho probably spend the winter in the lower Smith River and estuary, but locations and abundance would be difficult to document. Coho that survive the winter are about 100 to 120 mm (4 to 5 inches) and begin to outmigrate in March or April, with peak emigration usually seen in May. Coho undergo the smoltification process as they migrate downstream and by the time smolts reach the estuary they are bright silver with smoky black fins.

When the coho reach the ocean, they migrate northward and remain within the range of the Continental Shelf. Once at sea, most coho spend about 18 months feeding and growing before their return to their home river. The adult coho start returning to the Smith River in November and the run lasts until early February.

Steelhead trout

Steelhead exhibit one of the most varied life history patterns of any salmonid in the Smith River basin. As juveniles they are commonly referred to as rainbow trout, but their status as a steelhead or rainbow trout is not determined until they become adults. Maturing steelhead migrate to the sea and return in 2 – 6 years. Steelhead are the most abundant anadromous salmonid in the Smith River basin. Their numbers range in the thousands and adults spawn in more sub-watersheds than any other fish. The two races of steelhead in the Smith River are summer steelhead and winter run fish. A late run of winter steelhead enters the Smith River in March and April and these fish are commonly known as "blue-backs."

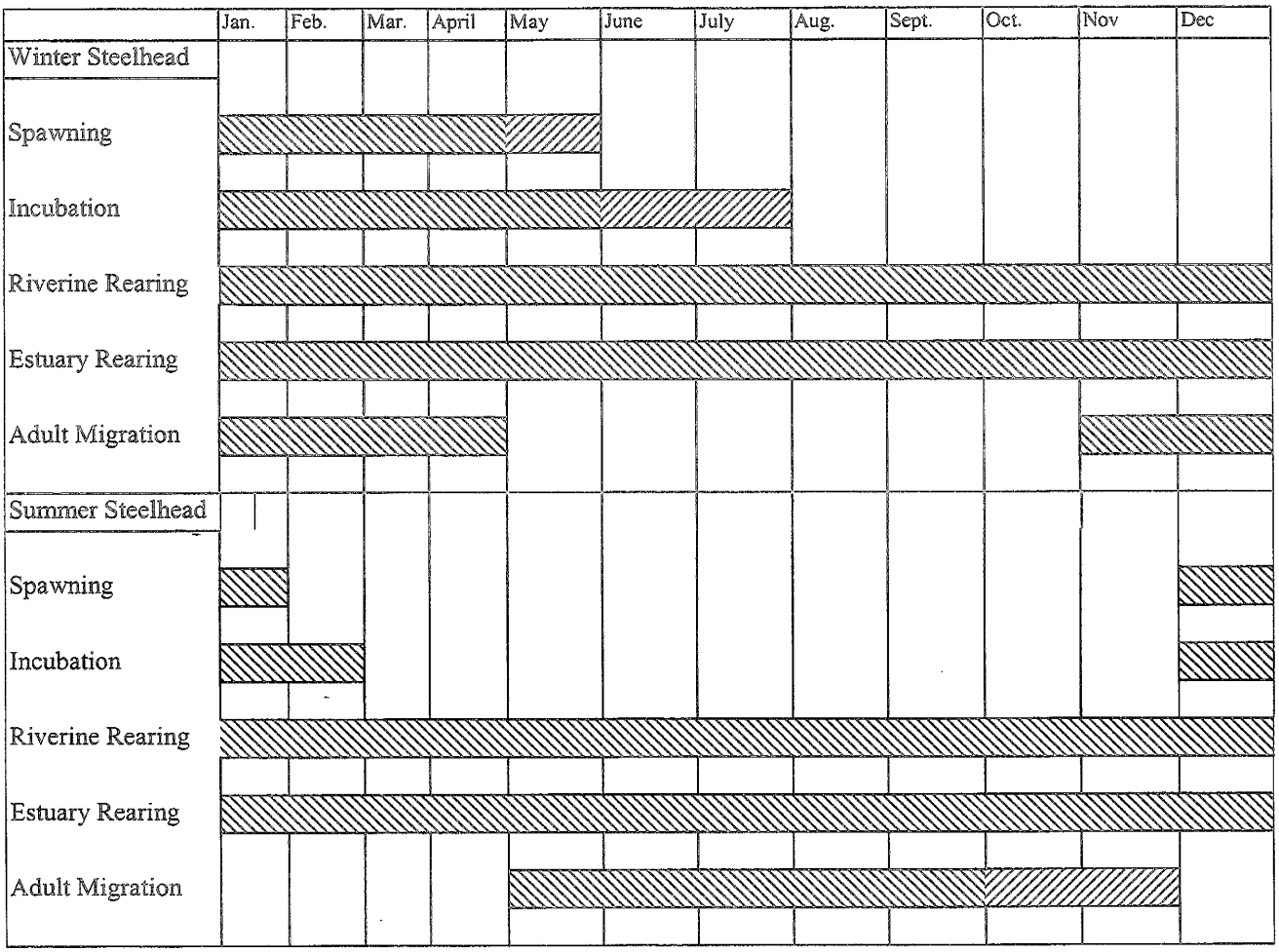
The winter run is the most abundant. In the 1960's, estimates made by California Department of Water Resources placed the run size in the neighborhood of 20,000 to 30,000 adults (CDWR 1965). Summer steelhead number fewer than 200 adults annually. The California state record steelhead, caught in the Smith River, weighed just over 27 pounds. The more common size of adult steelhead is 10 to 15 pounds, but several fish over 20 pounds are caught annually.

Steelhead spawn in the main forks and tributaries of the Smith River from January through May (Figure D3). Fecundity averaged 4050 eggs per female in 1997/1998 (Bob Will, pers. com. 1998). The female constructs a redd similar to that of other salmonids-with the female and male depositing eggs and milt simultaneously into the depression of the redd known as the pit. The female covers the fertilized eggs with two to ten inches of gravel. Unlike salmon, a female steelhead will not protect her redd.

After spawning is completed, over 50% of the males and females survive and swim downstream to the ocean. Post spawning adults are referred to as "runbacks" or "downrunners." Repeat spawners have been documented to spawn up to four times, but those are usually females that have short migration distances from their spawning grounds to the ocean (Barnhart 1986). Repeat spawners have not been studied in the Smith River basin, but the vast collection of scale samples from the Rowdy Creek Hatchery and creel survey would provide the opportunity to quantify the number of repeat spawners in the basin. The spatial and temporal separation between the summer and winter steelhead has perpetuated their individual life history patterns.

Incubation of the eggs in the redd lasts 30 to 50 days, dependent upon water temperature. Hatched alevins absorb their yolk sacs in about 20 days and begin emergence from the redd. Fry (25-30 mm long) emerge from the redds between April and July. As they grow, they move to deeper, swifter water for cover and increased food availability. Preferred habitats for the young of year fish are slow to moderate velocities, in depths up to five feet. Once the fish reach a length of about 100 mm (4 inches) they move to swift waters at the heads of pools and in riffles. Juvenile steelhead are widespread throughout the Smith River basin and utilize all types of microhabitats

Figure D3. Life history patterns of steelhead in the Smith River.



Most juvenile steelhead remain in freshwater for two to three years before migrating to the ocean. The most common life history pattern is for juveniles to stay in freshwater for two years and at sea for two years before returning to spawn (Busby et al. 1994). Since steelhead spend at least one winter in the freshwater system, they seek velocity refuges in winter to prevent being swept downstream. These sites may be secondary channels or flood plains that provide cover and food.

Coastal Cutthroat Trout

The Smith River is considered California's most important producer of coastal cutthroat trout (Gerstung 1997). All three main forks of the river and 47 tributaries covering 395 km (245 miles) have known or accessible habitat for coastal cutthroat trout.

Coastal cutthroat trout possess the most flexible life history strategies of any Pacific salmonid (Trotter, 1989). Northcote (1997) stated that "coastal cutthroat trout probably exhibit the broadest and most variable range in migratory behavior to be found in the salmonid complex." Three distinct variations can exist within a given population: 1) sea-run or anadromous fish; 2) non-migratory or

life history patterns has made it difficult to accurately describe the distribution, timing, and abundance of coastal cutthroat trout in the Smith River basin.

Mature sea-run cutthroat trout enter the Smith River beginning in August and extending through January (Johnson et al. 1994). Diver observations on a tributary and mainstem reach of the South Fork Smith indicated silvery sea-run adults first appeared in August, 1995 and their relative abundance increased through the end of September (Voight and Hayden 1997). Spawning occurs in small low-gradient tributaries from December through May, with a peak in February (Trotter, 1989).

Cutthroat trout, like steelhead, can spawn more than once in their lifetime. Typically the females are the ones surviving more than one spawning season and one fish was documented to have spawned five different times (Trotter 1997). Fecundity for Smith River cutthroat is unknown, but probably has a range of 250 to 1400 eggs per female (Trotter 1997). Fecundity depends on age and size, with repeat spawners having increased fecundity and larger eggs.

Cutthroat fry emerge between March and June, with a peak emergence in mid-April (Giger 1972; Scott and Crossman 1973 as cited in Johnson et al. 1994). Although juveniles may spend their first year in natal tributaries before beginning extensive movements up and downstream (Johnson et al. 1994), some of the lower Smith River tributaries become seasonally de-watered in their lowermost reaches. This increases the importance of mainstem river and/or tributary headwaters rearing habitat for young cutthroat trout during the summer months. Smolts (age 2 yr. or greater) migrate to salt water beginning from March through October, with peak emigration typically occurring in late May or early June (Johnson et al. 1994).

Immature sea-run cutthroat trout generally do not over-winter in the open ocean; instead they return to the mainstem river or tributaries between late-June and March of the following year (Johnson et al. 1994). The fish that did not mature during their first season in salt water will typically return to the ocean the following spring, sometimes repeating this pattern to several years before spawning (Meehan and Bjornn 1991).

Potamodromous coastal cutthroat trout exhibit life history strategies similar to those of anadromous fish, but with one major exception: they never leave freshwater. These fish utilize the mainstem of the Smith River in much the same way and at the same times as a sea-run fish utilizes saltwater (Tomasson 1978 as cited in Johnson et al. 1994). Resident coastal cutthroat trout may never emigrate from their natal tributaries, but instead remain stream dwelling fish for their entire lives (Johnson et al. 1994).

Cutthroat trout are opportunistic predators and are primarily piscivorous ("fish eaters") (Pauley et al. 1989). Larger cutthroat will inhabit slower deeper habitats near rearing areas where there is an ample food supply (other smaller fish). The available information about coastal cutthroat trout in the Smith River basin represents the largest information gap concerning any salmonid in the watershed.

Appendix E: DATA COLLECTION PROTOCOLS IN THE SMITH RIVER

This section is intended to provide guidance for cooperation and coordination between private and government entities conducting monitoring or assessment projects in the Smith River basin. An effort to form a cohesive basinwide monitoring and restoration strategy for the Smith River needs to develop through the SRAC.

Identifying the goals and objectives for monitoring is the initial step in creating a comprehensive strategy (Spence et al. 1996). A list of objectives will clarify what needs to be monitored, why and how the results will be used. Once these matters have been addressed, a choice of monitoring protocols will have to be made. Distinct geographic areas (i.e: the Smith River Plain, or the South Fork Smith River) can then be separated to establish specific sets of monitoring protocols.

Although the reasons to monitor a specific parameter within tributary watersheds may vary, a common goal is to determine the current conditions in a consistent and scientific manner. Many survey methodologies exist that describe watershed conditions. Smith River tributary watershed assessments should be conducted in the most consistent and coordinated manner possible. When all entities adopta set of scientifically sound methodologies, then all local efforts will be directly comparable over time. The task of agreeing upon common field protocols to be used by all entities in the basin will be a challenge, especially given the diverse ownership mosaic in the basin. In addition, the variability in stream channel morphology, geology, land use and biological communities requires that some flexibility accompany the methodologies used. A range of approved methodology options is therefore preferable to a "short-list" of protocols.

A group known as the Fish, Farm, and Forest Communities forum (FFFC) has adopted an "approved list" of field survey methodologies that employ the best scientific techniques. Some of these field protocols derive from agencies such as CDFG (e.g.: stream habitat mapping, LWD inventories (Flosi et al. 1998). Other survey methods have been developed through academic institutions and consultants (e.g.: single stream and regional fish population estimates and hillslope/road assessments). FFFC survey protocols are compatible to the aquatic monitoring needs in the Smith River and could provide comparability with monitoring efforts across northern California.

While it is important to establish links to other regional and statewide monitoring efforts, it is more critical to first create a monitoring/restoration strategy acceptable to everyone throughout the Smith River basin. Increased public participation at SRAC meetings and in local watershed groups will be necessary to create a unified approach. Last held in 1998. the Smith River Colloquium provides an excellent opportunity to increase public awareness of and knowledge about relevant issues, as well as to form community networks. In addition, the anticipated development of a Resources Conservation District (RCD) will enhance communication between landowners and resource managers.

Appendix F: CHEMICALS USED IN DEL NORTE COUNTY DURING 1999

According to the Del Norte County Department of Agriculture, each industrial user of chemicals must fill out a Pesticide Use report and file this report monthly with the county. Cal Trans is exempt from this reporting process and records of their chemical use can be obtained directly through Cal Trans. Home use of chemicals goes unreported. According to Del Norte County records in the year 1999, 52 different chemicals were used (Ted Sousa pers. com. 2001). A partial listing of the reported chemicals known to have potential impacts to aquatic life is contained in Table F-1.

Table F-1. Partial list of industrial chemical use as reported to the Del Norte County Department of Agriculture during 1999.

2,4-D	Glyphosphate (Round-up)	Chloropropham
Copper Sulfate	Diazinon	Methyl Bromide
Phorate	Thiophanate Methyl	Dimethoate
Chlorothalonil	Dimethoate	Triadimefon
Metam Sodium	Benomyl	Metolachlor
Thiram	Fenarimol	Copper Hydroxide
Disulfton	Oxyfluorfen	1,3-D
Pentachloronitrobenzene	Mancozeb	Chloropicrin
Diuron	Permethrin	Garlon (Roundup formula)
Carbofuran	Dicloran	Triclopyr (Garlon 4 formula)

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Appendix G: **SMITH RIVER REFERENCE LIST**

Note: This section is a "work-in-progress". It will be added to as new information related to the Smith River becomes available and/or older information is located. Special thanks to Zack Larson, Smith River Watershed Coordinator who compiled the papers, reports, and data listed below.

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