

State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

California Wild Trout Management Program
FALL RIVER MANAGEMENT PLAN

by

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and
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Region 1

Inland Fisheries
Administrative Report No. 86-2
April, 1986

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ABSTRACT

This plan describes Fall River and a history of its fishery with emphasis on data collected since it was designated for special wild trout management in 1972. Annual electrofishing indicated that rainbow trout population numbers and size were being maintained or improved under a two-trout limit that applied to the entire stream. At an upstream sampling site, the percentage of the rainbow trout population 14 in. or larger increased from three percent to over 30 percent over a nine-year period while three miles downstream the percentage ranged from 18 to 39 percent with no apparent trends during a six-year sampling period. Trout tagging indicated annual rainbow trout harvest rates were six to seven percent annually with more trout caught near their capture and release sites than in other river sections. Harvest rates were about four times greater in an area with no gear restrictions than in an area where gear was restricted to artificial lures with single barbless hooks. Creel surveys indicated that anglers released 92 to 93 percent of their catch in the gear restriction area, but where bait was allowed, the release rate declined from 76 to 53 percent from 1978 to 1982. Management goals and recommendations are listed to maintain and improve (1) the trophy aspects of the fishery, (2) the stream associated environment, and (3) angler access. An evaluation and monitoring program is also recommended.

^{1/}Inland Fisheries Administrative Report No. 86-2, Submitted April, 1986.

^{2/}Region 1, Department of Fish and Game

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PREFACE

During the mid-1960's a growing segment of the angling public began to voice concern over the deteriorating quality of angling in California trout streams. A century of damaging stream habitat alterations and heavy exploitation of wild trout stocks had obviously taken its toll.

In 1966, the Department of Fish and Game in the California Fish and Wildlife Plan recommended expansion of trout management activities to "protect and enhance wild trout fisheries." The plan further recommended "initiation of a basic study of California trout streams, concentrating on outstanding waters capable of providing quality fishing for wild trout." Nongame fish impact and the "potential of special regulations to enhance the amount and quality of recreation on such streams" were to be emphasized in the study.

In response to this recommendation and to concerns expressed by the public, the California Wild Trout Program was established by the California Fish and Game Commission in 1971. The primary purpose of the wild trout program is to identify, enhance and perpetuate natural and attractive trout fisheries where wild strains of trout are given major emphasis in contrast to the majority of the State's accessible waters that are managed by planting of domesticated catchable-sized trout on a "put and take" basis. The wild trout program, therefore, provides diversity in angling opportunity (another objective of the Fish and Wildlife Plan). Waters within the wild trout classification will receive greater attention than they would otherwise, if threatened by diversions, channelization, inundation, pollution or other incompatible development. The opportunity to test and institute various types of fisheries management activities such as population manipulation, habitat improvement and special regulations is an important component of the program.

Factors considered in the selection of wild trout waters include size, location, aesthetics and the readiness of people in the local area to accept the program. All waters selected for the program must be:

1. Open to public angling.
2. Of sufficient dimensions to accommodate significant numbers of anglers without overcrowding.
3. Able to support, with appropriate angling regulations, wild trout populations of sufficient magnitude to provide satisfactory trout catches in terms of both number and size of fish.

Each wild trout water is to have its own management plan and regulations which will emphasize individuality and diversity. Various types of management will be tried and the results measured and evaluated.

Specific management objectives for each water will use the general objectives of the wild trout program as guidelines. The program's general objectives are:

1. To maintain wild trout populations at levels necessary to provide satisfactory recreational angling opportunities.
2. To maintain and enhance where possible the habitat required for optimum wild trout production.
3. To preserve the natural character of the lake or stream-side environment.

This Fall River Management Plan reports the results of Department of Fish and Game management activities on Fall River over a 10-year period. It establishes fishery management goals and makes recommendations for attainment of those goals. A management evaluation and monitoring program is proposed.

This plan contains more detail than most wild trout plans in order to promote greater public understanding of its recommendations and to provide a basis for evaluating changes that may result from recommendation implementation.

A September 4, 1984 draft of this plan was made available for public review and numerous comments were received. Most of these comments are incorporated or discussed in the text of this report.

RESOURCE STATUS

General Setting

Fall River, a major tributary of the Pit River, is located in north-eastern Shasta County approximately 60 miles northeast of Redding in Fall River Valley. The river originates at Thousand Springs (elevation approximately 3,320 ft.), a series of springs rising from lava beds northeast of Dana, and flows 21.3 miles in a southerly direction before joining the Pit River below Fall River Mills. Since 1922, most of the flow has been diverted at the Pacific Gas and Electric (PG&E) Pit No. 1 Forebay, located just upstream from Fall River Mills. From the forebay, flow is diverted via a tunnel to Pit 1 Powerhouse on the Pit River (Figure 1). (Figures and tables follow the text since they are referred to in many text sections).

The Fall River watershed lies within the volcanic terrain of the Modoc Plateau geomorphic province. The river drains a 612-square mile area, but due to the porous volcanic nature of the region, most of the stream flow originates from springs within the valley. Bear Creek represents the only significant surface flow contribution to Fall River.

The orographic effect of mountainous terrain to the west of Fall River Valley results in moderate rainfall. The valley normally receives 18 to 27 in./year of precipitation with the mountainous areas to the west receiving as much as 60 in. Snowfall is light in the valley but may exceed 70 in./annum in the mountains. Summers are generally dry and hot (temperatures in the high 80s F are common) with subfreezing temperatures occurring in the winter. A strong afternoon wind regularly occurs throughout the valley during the summer.

Fall River is a moderate sized, slow moving, meandering meadow stream. It varies in width from 50 ft. in narrower stretches near its headwaters to 300 ft. in its lower reaches. Depths generally range from approximately 2 ft. in some shallow runs to an estimated 20 ft. in deeper pools. The mean gradient is less than 1 ft./mile.

Flows are relatively stable throughout the year due to the stream's spring origins. At the USGS gage near Dana, the river has a summer flow of about 450 (cfs). Extreme flows recorded for the 1958 to 1967 period were 353 and 3,910 cfs (US Geological Survey, 1968). The peak flows originate primarily from flood events on Bear Creek. Bear Creek flows into Fall River just below Thousand Springs, but is intermittent in its lower reaches during the summer.

In its uppermost 5 miles above Spring Creek, Fall River is about 75 ft. wide as it flows through ponderosa pine forests interspersed with wide, flat meadows. Spring Creek adds more cold, clear spring water to the river 5.2 miles below Thousand Springs. Below Spring Creek, the river broadens to about 100 ft. and meanders the remaining 16 miles through an open valley. Approximately 7 miles below Spring Creek, Fall River is joined by Tule River which flows out of Big (Trout) and Eastman

(Tule) lakes (Figure 1). These tributaries bring the total summer flow to about 1,200 cfs and channel widths to about 300 feet in the lower 9.3 miles of Fall River above the Pit No. 1 Intake.

The large volumes of spring water inflow maintain Fall River water temperature at near optimum ranges for trout production, even during mid-summer. At the Island Road Bridge, mid-summer temperatures are generally in the low to mid 50s °F and, near Glenburn and the Pit No. 1 Intake, in the low to mid 60s. At the Pit No. 1 Intake the maximum temperature recorded in 1984 was 69 F (Central Valley Regional Water Quality Control Board, 1985).

Land use in Fall River Valley is divided primarily between agriculture (42%) and grazed forest land (34%). Natural areas, water systems, and various developments account for nine percent, four percent, and 11 percent of total land use, respectively (U.S. Department of Agriculture, 1983). Major agricultural activities include beef cattle and alfalfa production, exporting of strawberry plants, and growing potatoes, grains, and seeds. Recently, wild rice culture has been introduced to the valley.

Land Ownership

Property along Fall River is almost entirely in private, individual ownership. PG&E owns land at the Pit No. 1 Intake, at a dredger site near Glenburn, and at the gasline crossing above Spring Creek (Figure 1).

History of the Fishery

Before 1950, the public was generally permitted fishing access to Fall River. A float trip along its 20-mile course was considered one of California's finest trout angling experiences. In the early 1950's, however, some riparian landowners began closing the river to the general public by posting their property against trespass and placing barriers across the stream to prevent boat movement. They also placed snag wires alongside county roads and bridges, effectively preventing anglers from fishing from these public thoroughfares. Fishing on Fall River thus became restricted to riparian landowners, their guests and those few people who could afford to purchase fishing privileges.

In 1958, a campaign was begun to have the river declared a navigable stream. In 1964, the Shasta County District Attorney filed suit in Shasta County Superior Court to halt the practice of impeding public navigation on the waterway. The court proceedings resulted in a May 1970 Memorandum of Opinion declaring Fall River legally navigable for fishing below the south boundary of Section 19, Township 38 North, Range 4 East (Zereda Jensen property).

In 1971, the Fish and Game Commission established a two-trout limit for Fall River and Spring Creek to protect the wild trout resource. In December 1972, the Commission designated all of Fall River for special management and habitat protection as one of the original 16 streams in the Commission's Wild Trout Program. Another restriction, limiting

fishing to artificial lures only (includes flies) upstream from Island Road Bridge was instituted in 1974 to reduce mortality of fish that were caught and released. In 1982, restriction to a single barbless hook was added to the lure area above the Island Road Bridge. The Department of Fish and Game has not stocked hatchery trout in Fall River above the PG&E Forebay since 1956 and the last experimental plant of hatchery trout in the Big Lake area was made in 1973.

Upper Bear Creek, in the vicinity of Highway 89 and Pondosa, is managed throughout the stream fishing season with regular plants of catchable-sized hatchery-reared rainbow trout. All waters within Fall River Valley, except for Fall River, are subject to the general fishing regulations of the Sierra District, including a 10-fish limit but no special gear restrictions; trout may not be taken in the Fall River Valley including Big and Eastman lakes from November 16 until the last Saturday in April. There have been no extensive investigations of wild trout populations in these adjacent waters.

Access

Because Fall River flows almost entirely within private lands, the public's opportunity and right to fish the section declared legally navigable is essentially limited to the use of boats or other floating means. However, legal boat access points are few. There have been three locations available to the public for boat access to Fall River: Island Road Bridge, the PG&E dredge site near Glenburn, and the PG&E ramp on Big Lake (Figure 1). In addition, Rick's Lodge, near the upper end of the river, provides limited commercial access with fees and other terms and conditions as determined by the owner or operator; access is generally restricted to lodge guests and limited to 15 to 20 boats. Numerous guides also access the river from the Harley Neuerburg property immediately downstream from Rick's Lodge.

The Island Road Bridge access site is owned by the California Trout Foundation and they allowed conditional public access here since 1976. Presently there is a very short access road, parking area for seven or eight cars, an additional parking area for guides and other commercial users, and a floating dock. Toilet facilities were discontinued in 1984 because of vandalism. Small boats can be hand-launched from the site but barriers prevent the launching of trailered boats. Gasoline engine powered boat launching is prohibited by Cal Trout. Beginning in 1983, Cal Trout prohibited commercial use of the access site except by permit. Fees were charged and proof of adequate insurance and licensing was required. This resulted in greatly reduced use of the access by guides and other commercial enterprises (much of this use then relocated to upstream sites such as the Neuerburg property). It is Cal Trout's policy to limit the influence of its Island Road site so that it does not contribute to the presence of more than 12 boats on Fall River at any given time.

Access was available at the PG&E dredger site near Glenburn through 1984. Although located on PG&E land, the dredger site is accessed from Highway A19 via a short, gated road that crosses two parcels of individually owned private property (over which PG&E has a deeded right-of-way). In 1985, one of these owners locked the gate to this access site and posted the area against trespass; therefore, future public access at this site is uncertain. The dredge site has a crude ramp for trailered boats which the public has been using for about 30 years. This site is located about 10 miles below many of the popular fishing areas. Large numbers of anglers fish near the dredge during the July Hexagenia (mayfly) hatch.

Access at Big Lake is via a 3.5-mile cindered road and a cindered ramp at the lake. This site (known locally as the Rat Farm), on PG&E property, is located about 14 miles from the most popular fishing areas on Fall River.

A Shasta County ordinance limits boat speeds to 5 mph on Fall River above the mouth of the Tule River. This speed limit, if observed, would help to prevent shoreline erosion but increases travel time to upstream fishing areas to over 2 hrs.

The only other entry for fishermen is by guest privileges from landowners or as a member or guest of private fishing clubs along the river.

Special facilities to aid the physically disabled public are completely lacking at all three public access sites. However, because near-shore terrain is gentle and dry and it is easy to drive close to the water's edge, some handicapped individuals can access the river at both the PG&E dredger and at the Big Lake access areas. Access for handicapped persons is much more difficult at the Island Road Bridge site, since the boat dock is some distance from the parking area and the intervening terrain is quite often flooded early in the fishing season.

Description of the Fishery

Aquatic Species

There are 10 species of fish established in Fall River upstream from the Pit No. 1 Forebay (Table 1). Of these, two are of special interest: the "Pit River" strain rainbow trout (Salmo gairdnerii) and the rough sculpin (Cottus asperinus). The "Pit River" strain rainbow is the only trout native to Fall River and adjacent areas of the Pit River drainage. At this time, there is no agreement on the names or taxonomic status of these native rainbow strains. Electrophoretic analysis of Fall River rainbow and of recently domesticated rainbow from the Pit River area below the Pit No. 1 Powerhouse indicates no cutthroat influence in spite of the cutthroat-like red markings on the throats of many fish. Further, these rainbow appear to be more closely related to anadromous California rainbow than to inland "redband" type rainbow (Gall, Bannon, Smith and Bentley, 1981). Fall River and "Pit

River" rainbow are unusual in their resistance to the endemic protozoan, Ceratomyxa shasta, which is usually fatal to most other strains of rainbow trout. Therefore, the hatchery strains of rainbow that were stocked in past years probably did not survive to spawn and contribute genetically to the wild population.

The rough sculpin is classified as rare by the Fish and Game Commission. While its distribution is limited to a short stretch of the Pit River and a few of its tributaries, the rough sculpin is common in many of those waters and is not considered to be in danger of extinction.

The Shasta crayfish (Pacifastacus fortis) is also native to Fall River. Its numbers are few and its distribution is severely restricted to several areas in the Pit River, Hat Creek subdrainage, and the Fall River System (Eng and Daniels, 1982). P. fortis has been classified as rare. Because of the Shasta crayfish's inability to compete with introduced crayfish species, its potential for hybridization, and the possibility of its overharvest, the California Fish and Game Commission has prohibited the take, possession, or use for bait of any crayfish species within the range of P. fortis.

Trout Habitat

Cut-banks, stream debris (logs, downed trees and bushes), man-made structures (dock and bridge pilings) and luxuriant beds of aquatic vegetation provide instream cover. Deep pools are found at most major bends in the river and moderately deep runs occur regularly along outside banks of the more gentle meanders. The stream bottom is composed largely of soft silt broken in places by lava and hardpan outcroppings. Extensive aquatic weed beds are vital to the continued productivity of the stream. The weed beds are the preferred cover of rainbow trout and harbor the profuse invertebrate life which contributes to the relatively fast growth rate of the trout and makes Fall River one of the finest fishing streams in California.

Spawning gravel is generally restricted to patches in the upper river, primarily above Rick's Lodge. The majority of spawning occurs in and below Thousand Springs, but trout also spawn in spring areas throughout the Fall River Valley system, most notably Spring Creek. Large rainbow trout that appear to be of Fall River origin have been caught by anglers in Bear Creek during the first few weeks of the fishing season. This seems to indicate that Bear Creek is used by Fall River rainbows for spawning purposes. The success of this spawn and the recruitment of young-of-the-year rainbows to Fall River is unknown. However, the abundance of yearling trout observed during annual fish population sampling in the upper portions of Fall River suggests that the availability of spawning habitat may not limit trout production in the upper river. However, fewer small trout are seen in the lower river, particularly below Island Road Bridge; recruitment may be a limiting factor in this portion of the river.

The rainbow trout spawning season appears to be protracted, especially in the vicinity of major springs. Trout form spawning aggregations as early as October and spawning takes place from November through early spring. Peak spawning activity occurs in January (M. Whipple, personal communication). On January 30, 1980, young-of-the-year rainbow trout, averaging 1.1 in fork length, were sampled from 51 °F water, approximately 0.25 mile below Thousand Springs. These fish were most likely the progeny of a late November spawn. In some years, a few adult fish can be observed over redds in the upper reaches of the river during the first week or two of April. This broad spawning season apparently results in a large variation in size after the first growing season. At first annulus, rainbow range from 2.6 to over 7 in. fork length (William M. Snider, personal communication). The protracted spawning season seems to result from the uniform and ideal temperature and flow conditions that exist for a relatively long period in Fall River.

Fish Populations

Historical data on the status of Fall River trout is lacking, but some general observations indicate that Fall River formerly held more and larger fish. According to the resident owners of Thousand Springs ranch, the number and size of spawning rainbow trout noted in the Thousand Springs area was greater before 1970 (Dr. & Mrs. Vincent Meyer, personal communication). Mr. Meryl Whipple, a long time resident of Fall River Valley, strongly believes that rainbow trout were much more numerous during the early decades of this century; it was common then to catch 3 and 4-pound fish.

Fish populations have been monitored annually on upper Fall River at two locations: 1) the 1.1 mile long "Gasline Section" beginning in 1975, and 2) the 0.7 mile long "Whipple Section" starting in 1978 (Figure 1). Sampling has been conducted entirely after dark during the last two weeks of August, using a Smith Root Model VI electrofishing pulsator mounted on a 16-ft. aluminum boat. Sampling equipment, methods, and times have been uniform from year to year. Collection efforts have attempted to capture all sizes and species of fish until 400 trout were obtained in the Gasline Section and 200 in the Whipple Section. No attempts were made to capture fish less than 6 in. (primarily sculpin and young-of-the-year trout) because they were too numerous and electrofishing is much less effective on small fish. Each year, data were tabulated for species composition and trout size distribution. Complete population estimates based on mark and recapture techniques were also made for rainbow trout greater than 6 in. in length in 1975 through 1978, and 1983 for the Gasline Section and in 1978 and 1983 for the Whipple Section.

The electrofishing data indicates that rainbow trout constitute, by far, the major component of the upper Fall River fish community; they accounted for an average of 91 percent and 71 percent of the fish sampled at the Gasline and Whipple Sections respectively (Table 2). Brown trout, which are caught infrequently by anglers, represent only four percent of the fish population numbers at the Gasline and a scant one percent in the Whipple Section. Nongame fish in Fall River are mainly Sacramento suckers and tui chubs. Nongame fish represent five

percent of the total population numbers in the Gasline and 29% in the Whipple Section (Table 2). This is representative of a general trend of increasing nongame fish numbers in downstream areas, a trend also indicated during electrofishing for trout tagging purposes during the late winter. This trend can be attributable to a variety of changing environmental conditions from the river's source to the Pit 1 Intake that favor nongame fish; e.g., water temperatures, turbidity, and shallow back-water all increase in downstream areas.

Population estimates show that rainbow trout numbers can fluctuate greatly from year to year (Table 3). The estimated number of rainbow trout over 6 in. ranged from 1,846 to 4,089 fish/mile at the Gasline and 1,643 to 3,390 fish per mile at the Whipple Section (Table 3). The fluctuations in the population estimates may be a reflection of actual changes in the population due to year class strength, river flow, or movement in or out of the sample section. It is very possible that local movement may occur in response to local changes in aquatic vegetation density. Lower vegetation density could also affect the efficiency of capture by electrofishing, particularly by making trout that have previously been shocked (mostly marked trout) less susceptible to recapture since they seem to avoid the electrical current. We have noted that it is easier to capture trout when dense aquatic vegetation is present.

The major emphasis of population sampling has been to monitor the trophy aspects of the trout population (defined here as fish 14 in. or greater fork length (FL)). In a reduced-limit fishery, large trout often have a greater potential for over-harvest than does the trout population as a whole.

At the Gasline Crossing, the percentage of trophy rainbow trout has increased from a low of 3% in 1975 to a high of 41% in 1982 while in the Whipple Section, the percentage dropped from 34% in 1978 to 18% in 1980 and 1981 followed by a recovery to 39 and 29% in 1982 and 1983 respectively (Table 3). Since we would expect annual changes in recruitment and aquatic vegetation to be relatively similar for the two stream sections, the differences between the Gasline and Whipple sections are most likely due to changing harvest rates on the larger fish and rates that are not the same in both sections. This possibility will be discussed in more detail in the Fishery and Environmental Management Section.

Trout over 20 in. have been seen only occasionally in the fish population sampling at the two sections so no trend is evident from 1975 to 1983 (Table 3). However, the frequency of these very large trout may be important in evaluating future management changes.

Trout Growth

On average, Fall River rainbow trout are age III+ before they attain 14 in. FL. An 18-in. rainbow would apparently be in its 6th yr., a rarity in most streams including Fall River. These larger, older fish are rare because they are exposed to natural as well as fishing mortality for a larger period. Historical observations (when harvest was

probably lower) indicate that even trout over 20 in. were more common than at present suggesting that this river and strain of rainbow still have the potential to produce more very large trout. Fall River trout growth is fast compared to growth in most other northern California streams (Snider and Linden, 1981) and compares favorably with lower Hat Creek and other nearby wild trout streams (Table 4).

A comparison of age/length data between 1978 and 1982 shows that the growth rate of Fall River rainbows has changed little, if any, over the past several years (Table 4, Figure 2). However, the 1982 sample rainbows averaged only 4.8 in. at first annulus formation compared to 6.7 in. in the 1978 sample. The growth rate in subsequent years appears to be similar because the slope of the age/length relationship is similar for 1978 and 1982 samples (Figure 2).

Creel Survey - General

Creel surveys have been conducted on Fall River since 1974. However, we will only present statistics for the 1978 and 1982 years since the sampling in those years was more intensive and the results should be more representative of the present situation. In 1978, access point checks were done primarily at Rick's Lodge and the Island Road Bridge access site, with about half the remaining survey effort accomplished by a checker in a boat that contacted anglers at various locations between the head of boat navigation and the Glenburn Bridge (Figure 1). Starting locations were systematically rotated so that check times varied for each river section. In 1982, most of the survey was done by boat, with some additional access point checks on opening weekend and on holidays. Angler effort comparisons between the years is not possible from the available data.

For purposes of census data gathering and reporting, the river was divided into geographically distinct sections (Fig. 1) that reflected differences in angler use patterns, fishing regulations and stream environment.

Angler Characteristics and Patterns

Fall River is recognized as one of the outstanding wild trout fisheries in the United States. Its reputation attracts many anglers from outside the immediate area. Over 80% of the anglers fishing the river in 1978 and 1982 originated from outside Shasta County; only 12 to 13% were from the local Fall River Mills-Burney area (Table 5).

In 1978 and 1982, 92 and 94% respectively of all anglers sampled were boat fishermen. Boat anglers can more successfully fish the large water and fish holding areas without trespassing on adjacent private land. Most shore anglers fish from private property fronting the river.

Above Island Road Bridge, boat fishermen primarily use a non-gasoline powered mode of transportation, most often small, electric motorpowered prams. From 1978 to 1982, the percentage of anglers in the upper three sections of the river using gasoline engines decreased from 9 to 5%. Below Island Road, the situation was reversed. Here, roughly 60% of the anglers surveyed during 1978 and 1982 were using gasoline engines. Overall, approximately 20% of the boat fishermen on Fall River use gasoline powered engines (Table 6).

Fall River presently does not possess a substantial one-way drift fishery. Boat anglers putting in at a given launch site fish primarily in adjacent river sections (Table 7) and generally take out at the same location where they launched (Table 8). Only 15% of the anglers launching at Rick's Lodge in 1982 took their boats out at the Island Road Bridge access site (Table 8).

In 1982, over 82% of the anglers fishing Fall River used artificial lures and flies only, a 10% decrease from 1978. Below the Island Road Bridge, only 44% of the anglers sampled in 1982 used artificials exclusively. Above the Island Road Bridge, angling regulations restrict the method of take to "artificial only" so the small amount of bait use recorded there was illegal (Table 9).

Anglers fishing with "artificial lures only" accounted for 81% of the trout caught (including those released) in 1982, although they accounted for only 34% of the total trout kept; "artificials only" fishermen kept only 8.6% of their own catch. Fishermen using "bait only," although they hooked only 14% of the total trout caught, were responsible for 52% of the total trout kept; bait anglers kept 74% of their own catch. The greatest change in gear statistics between 1978 and 1982 appears to be related to the greater portion of the total catch taken by bait anglers and the bait anglers keeping 74.2% of their catch in 1982 (compared to 37.0% in 1978).

The relatively high release rates on Fall River probably are related to the catch and release ethic that is important to many of the fishermen attracted to the two-trout bag limit stream. It may also be due to the "mossy" taste of trout that some anglers report.

Catch Data

Creel checks in 1978 and 1982 confirmed population sampling that shows the Fall River fishery to be predominately rainbow trout. Of 1530 trout reported caught by anglers sampled in 1978 and 1553 trout reported in 1982, less than 1% were identified as brown trout (Table 11).

Angler success (catch per hour) is generally moderate on Fall River, reflecting the challenging conditions fisherman often encounter. Catch rates declined in all areas of the river, from an average of 0.52 trout/hr. in 1978 to 0.32 trout/hr. in 1982 (Table 11). The overall proportion of the trout catch that was released by anglers fell from 89% in 1978 to 81% in 1982. Above Island Road Bridge, however, release rates remained high and stable (92-93%), whereas below Island Road

Bridge they dropped dramatically from 76% in 1978 to 53% in 1982 (Table 11). This drop can be attributed to the marked increase in the portion of anglers fishing with bait below Island Road Bridge (Table 9) and bait anglers keeping a much greater portion of their own catch (Table 10).

The average length of rainbow trout kept increased almost 1 in. from 12.6 in. FL in 1978 to 13.5 in. FL in 1982 (Table 11). The proportion of creel rainbow trout that exceeded 16 in. FL (nose to fork in tail equals approximately 17 1/2 in. total length) remained about the same between 1978 and 1982. The percentage of rainbows kept falling into this category was approximately three times as great below Island Road Bridge (13%) as above Island Road Bridge (4%) in 1982 (Table 12).

The decrease in the catch/hr. between 1978 and 1982, while the average size increased over the same period, suggests that more trout were recruited to the smaller sizes and age classes in 1978 and fewer in 1982; thus it would appear that stronger year classes resulted from the 1976 and 1977 years (the drought years when Bear Creek inflows were low and groundwater inflows were affected little) and weaker year classes from 1980 and 1981 (this same type of influence from Bear Creek might also relate to the lower first year growth indicated by scale analysis in years when Bear Creek has more influence on turbidity and temperature as would be expected following drought years). Some of the changes between 1978 and 1982 may also be an artifact induced by differences in creel census methods utilized in 1978 and 1982 (see section: Creel Survey - General).

Fifteen percent of the anglers fishing Fall River in 1982 were accompanied by professional guides. Most of this guide activity was above the Island Road Bridge (Table 13). The creel survey indicated that guided anglers released all trout caught while unguided anglers released 89% of their catch. Guide-related data were not recorded in 1978.

Trout Harvest Rates

Trout harvest (exploitation) rates were determined by tagging wild trout in Fall River. Trout were captured by electrofishing in the winter and spring of 1978 and 1979. Five-dollar reward, modified Carlin trailer type tags (Nicola and Cordone, 1969) were affixed to each fish, the fish were measured, and then released in the area of capture (Table 14).

In order to compare harvest rates for different areas, the river was divided into five sections identical to those used for the creel census study. However, Section Five, because of its extensive length, was further subdivided into Sections 5A, 5B, and 5C (Figure 1).

Since only 13 brown trout were tagged and only two of these tags were returned by anglers, valid harvest rate and migration data for brown trout could not be determined (only 1.6% of the trout tagged were browns).

From 1978 through 1980, anglers returned 170 of the 794 tags from rainbow trout. Each angler returning a tag was asked if he released the tagged fish or if he kept it; if the fish was kept, he was asked if he would have kept the fish had it not been tagged. Angler responses indicated that 58 of the 170 returned tags were on fish that were kept only because they were tagged; the balance of 112 represented (true) harvest for an untagged population. All the following information on harvest is based on these harvest returns rather than on total tag returns.

Overall, annual rainbow trout harvest rates were quite low on Fall River, ranging from 6.4% in 1978 to 7.1% in 1980. Below the Island Road Bridge, however, harvest rates are approximately four times those found above. Sections 5A and 5C consistently showed the greatest rate of trout harvest of any sections on the river (Table 14).

Anglers appear to be harvesting larger rainbow trout at higher rates than smaller ones although sample sizes for returned trout are small for the larger size fish and for fish above the Island Road Bridge (Table 15).

Rainbow Trout Migration Patterns

All tag returns from 1978-1981 (not just "true harvest" returns), totaling 176 fish were examined to determine movements of Fall River rainbow trout. Tagged trout were recaptured in the section tagged at a greater frequency than any other single section (Table 16). Sixty-one to 64% of the fish tagged in Sections 2, 3, and 4 were recaptured in the same section where tagged. Fifty percent or less of the fish tagged in Sections 5A, 5B, and 5C were caught in the section where they were tagged, but more were caught in the section where tagged than any other single section. This indicates more movement between tagging and recapture for fish tagged in the lower reaches than in the upper reaches of the river.

For tagged fish that were taken in a section other than where tagged, greater returns came from the downstream area for fish tagged in Sections 2, 3, and 4. These may have been fish that were initially tagged as they were moving from the headwater spawning areas to a residence territory during the March-April tagging period. Fish that were tagged in Sections 5A, 5B, and 5C showed a greater tendency to be caught above the section where tagged than below. This may reflect a tendency for these fish to move upstream particularly during the summer months when water temperatures become high or this could be a reflection of the greater area available for capture upstream.

Relatively few fish were caught outside of the Fall River two-trout limit area. Only one tag was returned from Bear Creek and this seemed to confirm early season spot creel survey and electrofishing information from Bear Creek during the 1978 to 1981 period - very few large fish that may have been from Fall River were seen. This is in contrast to 1984 when many large trout were reported from lower Bear Creek during the early part of the trout season.

Nine tagged trout were reported from the Tule River - Big Lake system. However, all nine of the tag returns represented true harvest. This seems to indicate that angler release rates in the Tule River - Big Lake system may be very low compared to most sections of Fall River (we attribute this difference primarily to 10 vs 2 trout bag limit regulations). The nine Tule River area tag returns accounted for 7.8% of the total true harvest returns for the entire period of 1978-1981. This percentage of harvest in adjacent waters would be expected to be even higher if Fall River harvest rates were to further decrease in response to stricter angling regulations.

MANAGEMENT PROGRAM

Management Goals

The goals of wild trout management on Fall River are to:

1. Protect the aquatic environment of Fall River and its tributaries, including maintenance or improvement of existing optimal habitat conditions for trout and rare and endangered species. In the area above the confluence with Tule River habitat characteristics deemed most critical are:
 - a. Plentiful and stable flows.
 - b. Temperate (40-55 F) water.
 - c. High water transparency and low suspended sediments.
 - d. An absence of harmful pollutants.
 - e. Adequate clean spawning gravels.
 - f. Sufficient instream vegetative cover.
 - g. Stable stream banks.
2. Perpetuate native aquatic species, particularly the indigenous Fall River strain rainbow trout, the rare rough sculpin, and the rare Shasta crayfish.
3. Maintain a trout population and size structure capable of producing outstanding wild trout angling opportunities including the opportunity to catch and release many trout.
4. Maximize the opportunity to catch trout over 14 in.
5. Preserve the attractive character of the stream as exemplified by a pastoral setting with agricultural uses and low density, large parcel residential development.
6. Provide for public access while minimizing the impacts of boat travel on the shoreline and on other river users.
7. Evaluate and monitor changes in the habitat and fishery to direct the future management program.

Fishery and Environmental Management

Fall River possesses an outstanding wild trout fishery. Since the river was placed in the State Wild Trout Program and trout population evaluations began in 1975, the trout population structure (percentage of trophy trout) has generally been maintained or improved even though fishing pressure has probably increased. This response is attributed to restrictive angling regulations.

Fish population sampling in the Gasline Section indicates a trend of increasing percentages of trophy (14"+) trout, while 3 miles downstream in the Whipple section, the percentage declined between 1978 and 1981 and then increased (Table 3). Since it appears unlikely that the differences between the two sections are attributable to differences in recruitment or to habitat changes, the differences are probably due to angler catch impacts, primarily the selective harvest of large trout. Since fish over 14 in. are a relatively small part of the total population (Table 3) and since angler harvest appears to select for larger trout (Table 15), even minor changes in total harvest may have substantial impacts on trophy-sized trout.

Overall, the Fall River fishery appears to be healthy. Harvest rates, even for the lower reaches of the river, are moderate when compared to other fisheries. The trophy aspects of the fishery are impressive and catch rates are reasonable given the difficulty of fishing this water by the uninitiated. But, there are still a number of questions to be answered, including: (i) What is the ultimate potential of Fall River in supporting a wild trout fishery, particularly trophy fish? (ii) Can the river produce larger trout? (iii) What were trout population structures like historically? (iv) Can we approach historical (maximum) conditions by employing the proper angling regulations and environmental enhancement?

Based on the accounts of long time residents, (see Fish Population section) the fishery of Fall River, since being opened to the public, has never recaptured its historical quality. Fish population data do show that the trophy fishery has been steadily improving in the Gasline section of the river since formal population monitoring began in 1975 (Table 3). This population improvement may not have plateaued, indicating further beneficial changes are possible. However, there have been no indications that the number of "super trophy" trout (fish greater than 20 in.) has increased as a result of present management activities. This segment of the trout population is the smallest in numbers. Even very low harvest rates, if highly selective for large size trout could substantially diminish trophy and super trophy trout numbers.

The following recommendations are proposed to achieve management objectives, including maintenance and restoration of the wild trout fishery to a level approaching maximum biological potential, including potential for "super trophy" trout.

Bait Restrictions

The greatest differences in the Fall River fishery are seen between the area above Island Road Bridge which is restricted to artificial lures and the area below the bridge where bait can be used. Restrictions on the use of bait above the mouth of the Tule River offer a substantial opportunity to improve the fishery in this area.

Recommendation 1: Extend the bait prohibition downstream to the mouth of the Tule River.^{1/}

Elimination of bait angling from this stretch of river will reduce harvest rates and increase release rates dramatically. The survivability of released fish should also improve markedly. Catch rates should increase due to the recycling of fish which were formerly removed from the population. The average size of trout caught should also increase as released trout grow before they are caught again.

The gear restriction to artificial lures above the Island Road Bridge has created a fishery where anglers in 1978 and 1982 released 92 to 93% of their catch (Table 11). Below the Island Road Bridge the release rate dropped from 76% in 1978 to only 53% in 1982 (Table 11); this decline is because bait anglers kept a much higher portion of their catch. In 1982 below the Island Road Bridge, bait anglers accounted for only 39% of the angler use (Table 9), but 70% of the total trout kept. Trout tagging in 1978 and 1979 indicated that the harvest rate for trout was four times greater below the bridge than above (Table 14).

The higher harvest rates and lower release rates below the Island Road Bridge suggest that more and larger fish would be available to the angler here if bait fishing were prohibited. The decreasing release rate below the bridge is of concern in the future even though the average size of trout kept by anglers increased slightly between 1978 and 1982; this increase in average size occurred both above and below the Island Road Bridge (Table 12) and may be a reflection of poor recruitment in recent years. A much greater increase in average size below the bridge would have been expected if the harvest and release rates were comparable to those above the bridge - the area with gear restricted to artificials.

^{1/} At its December 6, 1984 meeting, the Fish and Game Commission adopted this regulation for the 1985 angling season.

The declining release rate below the Island Road Bridge could be a precursor of declining average sizes of trout there. Extension of the gear restriction downstream to the mouth of the Tule River would improve angling prospects in this reach and could preclude a decline in angling quality. Since the average size of trout below the bridge has been higher in spite of the higher harvest rates, it appears that this reach of stream has a greater potential for improvement with more restrictive regulations - the trout growth potential is there.

However, by extending the gear restriction to the mouth of the Tule River, 41% of the legally navigable section would still be open to bait fishermen; this lower area (along with adjacent waters) will remain as bait and take-emphasis fisheries while Fall River above the mouth of the Tule River would be a release emphasis fishery.

Maximum Size Limit

A maximum size limit appears to offer the best way to meet the fishery management objective of maximizing the opportunity to catch trout over 14 and 20 in.

A maximum size limit allows the harvest of smaller fish that are more easily replaced by reproduction and eliminates the harvest of large fish that are very difficult to replace, resulting in more large fish. The beneficial effect of eliminating the harvest of large fish is compounded since many of these fish may be caught a number of times and grow between captures.

A maximum size limit also allows some harvesting of smaller trout, thereby releasing important resources such as food and shelter to potentially increase the growth rate and survival of the remaining population. The harvesting of smaller trout may, therefore, shift a population's structure from one which has many fish, but few large individuals, to a size structure represented by fewer fish overall, but more large individuals.

Lastly, a maximum size limit enhances the genetics of a trout population by allowing larger, faster growing and, in that regard, genetically superior fish to survive and spawn so that they contribute more to the genetics of future generations. At the present time, the genetic contribution of such fish is minimal because larger fish are selectively harvested by anglers (Table 15).

A maximum size limit on Fall River should maximize the number of large trout that are available for catch and release in contrast to a minimum size limit which would maximize the number of trout over the minimum length that are harvested. Harvest of these large fish is inconsistent with the management objective to maximize the number of large and very large trout.

A minimum size limit increases the number of trout below the size limit designated, but does not protect trophy-sized fish unless the

minimum size is rather great (such as the 18-in. minimum size at Hat Creek which actually acts almost as a "0" bag limit). A minimum size limit is often enacted on waters where natural reproduction is insufficient due to a scarcity of sexually mature fish. A minimum size limit in such waters protects fish long enough to ensure that they have the opportunity to spawn at least once, but often shifts harvest pressure to larger size classes. The end result is a larger population of small fish. A regulation of this type would be inappropriate for achieving the Fall River management objectives.

A zero fish limit (catch and release) would equally protect all size classes of a fish population. Total trout numbers would increase, but some stunting of growth could occur since a finite amount of resources would have to be shared by more fish. Maintaining large numbers of trout does not appear to be a problem in Fall River, whereas optimizing the trophy potential of the river has not been realized since historical times. A maximum size limit appears to be more appropriate than a zero fish limit in meeting the Fall River objectives.

Recommendation 2: Institute a maximum size limit of 14 in. TL for all trout caught in the special regulation area, so that only two trout, 14 in. TL, or less, may be kept on Fall River and Spring Creek from Thousand Springs to the mouth of the Tule River.^{1/}

Recommendation #2 is intended to enhance the trophy aspects of the upper Fall River trout population. Since the size of trout kept on Fall River averaged 13.5 in. FL in 1982 (Table 11), a 14-in. maximum TL limit would allow anglers to keep trout smaller than the 1982 (approximate) average and require the release of those over the average. This regulation would be experimental in nature and evaluated over several years. It could be modified or eliminated if data collected during the evaluation indicate a change is warranted.

Bear Creek Spawning

Although reward tag data (Table 16) indicated that few Fall River trout returned from Bear Creek (this may have been due to the Bear Creek run-off pattern in the years following the tagging), numerous anglers have, over the years, reported seeing and catching large Fall River spawners on Bear Creek during the first few weeks of the fishing season.

Upper Bear Creek is presently managed with catchable trout planted at several easily accessible locations near and above Pondosa. Lower reaches of Bear Creek are not stocked and are fished primarily in the early season by anglers looking specifically for large trout. The trout season on Bear Creek has opened on the last Saturday in April and continued through November 15 (the same season as Fall River).

^{1/}At its December 6, 1984 meeting, the Fish and Game Commission adopted this regulation for the 1985 angling season.

Recommendation 3: Delay the opening of trout season on Bear Creek to the Saturday preceeding Memorial Day for that section of stream downstream from Pondosa.^{1/}

Recommendation 3 will protect spawning Fall River rainbow trout during their period of highest vulnerability in Bear Creek but will not affect Bear Creek's catchable trout fishery which is located from Pondosa upstream.

Two Trout Limit in Adjacent Waters

A two-trout limit has been suggested for waters adjacent to Fall River such as Tule River, Eastman Lake and Big Lake. There is some merit to this suggestion: (i) These waters are not stocked with hatchery trout since past experimental stockings have produced returns too low to justify a regular stocking program. The trout fisheries are dependant on limited natural reproduction that probably occurs primarily in spring-fed tributaries and in upper Fall River. The 10-trout per day limit that applies to these adjacent waters probably results in over harvest and some anglers have complained of declining angling quality. However, data on harvest rates and angling quality in the Tule River system are not available because the Department has not had the resources to conduct the very substantial studies required. (ii) A two-trout limit throughout the Fall River Valley would make enforcement of the Fall River angling regulations much easier and more effective. With such a regulation, there would be fewer over limits taken from Fall River (some boat anglers presently claim they caught the trout in excess of the two trout Fall River limit in adjacent waters). (iii) Catch rates of Fall River origin fish would be reduced in the adjacent area. The catch of Fall River origin trout that are taken in the 10-trout limit area (Table 16) would be reduced. (iv) Angler use and harvest could increase in the near future as use of the new Ahjumawi Lava Springs State Park in the Big Lake area increases and as access to the park is developed. Such future increases in harvest could reduce the quality of the fisheries in these adjacent waters as well as in Fall River.

Anglers opposed to a valley-wide two-trout limit express concern that the two-trout limit would reduce angling opportunity and that gear restrictions might eventually be added, making fishing by families and less experienced anglers more difficult. Returns of tags from trout tagged in Fall River (Table 16) indicate that about 8% of Fall River origin trout taken (true harvest only) are caught in the Tule River system; this 8% harvest would be reduced only to the extent that anglers are taking more than two trout per day in the 10-trout limit area. Past proposals to reduce the limit to two trout have been vigorously opposed by some anglers and the Fish and Game Commission has not adopted them.

Recommendation 4. Support a two-trout limit throughout the Fall River Valley when such a proposal receives greater public support or when more adequate resource data are available to justify the change.

^{1/} At its December 6, 1984 meeting,, the Fish and Game Commission adopted this regulation for the 1985 angling season.

Bank Erosion

Bank erosion appears to be the most serious environmental problem affecting trout habitat on Fall River. Most of the problem seems to be related to uncontrolled grazing of cattle along stream banks and within shallow areas of the river. Through grazing and trampling, stream banks are denuded of vegetation and broken down. Often the problem is exacerbated in areas where muskrats weaken ground surfaces with their tunneling. Speeding power boats aggravate the situation further by producing wakes that cut into denuded and destabilized banks. Many areas that have become favorite drinking and gathering places of cattle have been converted to large, shallow-water mud wallows that are relatively unproductive trout habitat.

Bank destruction increases turbidity and siltation, and eliminates near shore trout cover. Overhanging banks (prime trout cover) disappear quickly. In some areas an insidious, prolonged process has occurred where banks are continually broken down in a "progressive" fashion, resulting in widening of the river and creation of large, shallow, bay-like backwater areas. These shallow back-water areas act as solar collectors, heating the water. These areas also collect large amounts of sediment making them less suitable for trout and more suitable for nongame fish. Problem areas occur throughout the length of the river, but appear to be especially concentrated between Island Road Bridge and the mouth of the Tule River.

Recommendation 5: Provide financial support to landowners for fencing to exclude cattle from Fall River bank areas where erosion potential is identified.

Public funds are available so that fencing could be accomplished at little or no cost to landowners, particularly if a number of programs are applied concurrently: (i) The U.S. Agricultural Stabilization and Conservation Service provides 75% federal financing for stream protective measures, (ii) the Department of Fish and Game is recommending that Dingell-Johnson (Federal excise tax) funds be used for bank protection projects on Fall River, (iii) the California Forest Improvement Program provides funds for fish and wildlife enhancement on private property with contiguous forested areas (one such project was completed on Fall River in 1984). The Department of Fish and Game will also examine the possibility of accomplishing maintenance with public funding sources. Where necessary to protect the integrity of banks and fences, muskrat control can be accomplished with Department permits and public funding assistance. Such programs will improve streamside habitat for both fish and wildlife plus prevent further loss of very valuable private lands without affecting cooperating landowner rights (e.g. the lands would remain private and the public would not get access or other rights to the land). Access to the river for cattle watering would be developed. Landowner participation would be voluntary.

The Department of Fish and Game aerielly photographed the entire river in 1985 to help identify bank erosion problem areas (and document the status of riparian and aquatic vegetation plus existing physical condition of the river). Additional photo series in the future will help document progress or new problem areas.

Boats exceeding the 5 mph speed limit above the mouth of the Tule River also have a substantial impact on bank erosion, particularly those banks with heavy cattle use. Boat speeding and gasoline engine use are discussed in following sections.

Prohibition of Gasoline Engines

A ban on the use of gasoline engine powered boats on Fall River above the mouth of the Tule River has been proposed. A pro and con summary of this proposal follows:

Gas engine use is presently so low above Island Road Bridge that prohibiting gas engines there does not appear to be necessary. The trend of gasoline engine use is downward in the upper area with use dropping from 9 to 5% between 1978 and 1982 (Table 6).

Between the Island Road Bridge and the mouth of the Tule River about 60% of the fishing use involves gasoline motors (Table 6). Here access via electric motor from the PG&E dredge launching site could be quite difficult for some anglers since they would have to travel 1.4 miles upstream with an electric motor before they reached the mouth of the Tule River. Anglers fishing downstream from the Island Road Bridge access site could have some difficulty returning with battery power. Additionally, it appears that other users, such as waterfowl hunters, would find it impossible to travel the river without gas engine power.

Supporters of gasoline powered boat use feel that the severely limited access on the upper river requires anglers wishing to fish upstream Fall River areas to launch at downstream locations. The only way for these anglers to reach upstream areas is by use of gas powered motors. Others have suggested that streamside landowners would not be able to maintain their property or agricultural operations without the use of gas powered boats.

Those that oppose the use of gasoline engines say that exceptions to a gasoline engine ban could be made for stream-side landowners for managing their property. Opponents of gasoline engines say these engines adversely affect the aesthetics of the angling experience on upper Fall River. The noise they generate disturbs the tranquility of the angling experience and annoys local residents. Exhaust smoke and petroleum residues in the water may also be objectionable. Most importantly, boats powered by gasoline engines often exceed the 5 mph speed limit above the mouth of the Tule River creating wakes that erode and destabilize stream banks. In some areas where cattle damage to banks is severe, power boating aggravates erosion and the resulting turbidity and siltation is detrimental to the fishery. In the

narrower reaches of the river above the mouth of the Tule River, gas powered boats interfere with anglers, often "putting down" fish.

Recommendation 6: The use of gasoline powered motor boats should be discouraged on Fall River from the mouth of the Tule River upstream to the limit of navigability; gasoline motors should not be prohibited by regulation unless informational signs and cattle exclusion from stream banks fail to control the bank erosion problem.

Alternatives to the prohibition of gasoline engine use should be attempted before a prohibition is considered further. Information signs explaining the problems associated with gas engine use and exceeding the 5 mph speed limit on upper Fall River should be displayed at the PG&E dredge site, at the confluence of the Tule River, and at all other access points on the river; the Department of Fish and Game should be responsible for coordinating this effort. The cattle fencing program (Recommendation 5) should do much to reduce the impact of gasoline powered boat wakes. Shasta County should be encouraged to increase enforcement of the 5 mph speed limit on upper Fall River (see Recommendation 7). If these measures are not effective in controlling the erosion problem, gasoline powered motors should be prohibited on Fall River above the mouth of the Tule River.

Boat Speed Limits

Speeding boats present a problem on upper Fall River even though Shasta County has an ordinance limiting boat speeds to 5 mph above the mouth of the Tule River. Speeding anglers and other river users present a serious threat to safety, the environment (discussed earlier) and interfere with fishing (discussed earlier). However, the speed limit is often violated since enforcement effort appears low and enforcement is difficult.

Below the Tule River confluence, Fall River is wider, has fewer steep banks, and less cattle-damaged shoreline. High speed boats do not appear to be a serious problem in this area.

Recommendation 7: Encourage Shasta County to patrol upper Fall River on a regular basis to ensure compliance with the 5 mph speed limit; signs describing the adverse impacts of speeding should be posted.

The sign posting is related to Recommendation 5 and should be coordinated by the Department of Fish and Game.

Limited Fisherman Use

Some anglers that remember Fall River before it was declared navigable maintain the river is presently overcrowded with fishermen. They say that the very nature of the river - its tranquility - is being destroyed by overuse and the number of anglers fishing the river at any given time must be controlled to return Fall River to former conditions.

Although use has certainly increased since the river was opened to the public, use is relatively low during most of the season. Data and general observations indicate substantial angler use occurs only during the opening weekend of the fishing season and during some early season major holiday periods. During the latter part of the summer and fall, use is quite low.

To control or limit angler use on Fall River would be difficult and prohibitively expensive. Limiting use on Fall River may also conflict with the public's legal navigation right.

Anglers themselves may already be limiting the intensity of use in their quest for a aesthetically pleasing angling experience. For example, there is some indication that anglers avoided fishing on Memorial Day weekend in 1984 since the parking lot at the Island Road Bridge access was never full during that weekend; however, it was often full to overflowing during the following week (this was one of the very few times during the whole year that parking restrictions tended to affect anglers use from this access). Anglers themselves were apparently trying to avoid anticipated heavy use periods. Their experience in one year may well further influence use patterns in subsequent years. These factors, rather than access availability, may be adequate to prevent excessive concentrations of anglers during most of the year.

Recommendation 8: Do not control the number of anglers fishing Fall River unless other regulations and access restrictions are unable to prevent detrimental impacts on the trout population or the quality of the angling experience.

Use levels on Fall River are not high enough to warrant control of the number of anglers fishing, even during peak use periods. Increases in fishing pressure that may detrimentally affect the trout population can be best ameliorated by changes in fishing regulations. However, control of the number of anglers through limited parking at upstream access points may be a practical method of controlling use (see Recommendations 9 and 10).

Limited Guide Use

Professional angler guide activity on Fall River increased from a handful of individuals in 1978 to approximately 20 guides in 1982. No information on the exact number of individual guides is available. Concern has been expressed that the increased guiding has been adding appreciably to fishing pressure and increasing trout harvest. Creel census data, however, shows that guided anglers constituted only 15 percent of the total angler use on the river in 1982. The creel data showed that the guided anglers sampled did not keep a single fish; therefore, their direct impact on the fish population seems negligible.

Professional guides appear to be providing two beneficial services. First, they are creating an opportunity for novice anglers to enjoy a

successful fishing experience on what is considered a technically difficult trout stream. Secondly, they are instilling a catch-and-release ethic in anglers and providing instruction in proper fish release techniques.

Guides have also been criticized for competing for limited parking spaces and for creating "heavy" traffic on certain sections of the river. In 1982, a favorite routine for many guides was to park at the Island Road Bridge Access Site and then fish between Island Road Bridge and Spring Creek Bridge.

Beginning in 1983, Cal Trout instituted restrictions that severely reduced the number of guides launching at the Island Road Bridge access site. Since 1983, some guides have made arrangements with private property owners for access so that much of the guide use was concentrated above the Spring Creek Bridge.

Recommendation 9: Do not restrict angler guide use on Fall River.

Restrictions on guide activity are not warranted at this time.

Public Access

Since Fall River was first declared navigable, there has been concern that the general public does not have reasonable access to the upper reaches of the river. Maintenance of public access is a public trust responsibility for state agencies including the Department of Fish and Game. The California Trout Access Site at Island Road Bridge is the only location along the upper river that provides public access. It is privately owned, however, and the terms and conditions for launching there could change, or access could be denied at any time. Parking at this access site is limited. Since launching at the Island Road Bridge access is restricted to non-gasoline powered craft, the feasibility of fishing above Spring Creek is quite remote: it is too far for most anglers with electric motor or paddle boats launched at Island Road and even too far for gasoline powered boats launched at the PG&E dredge site. The 1978 and 1982 creel checks indicate that only 2-3% of the anglers launching at Island Road Bridge fished above Spring Creek Bridge and none fished above Rick's Lodge; only 1% or less of the anglers launching at the PG&E dredge site fished above the Spring Creek Bridge (Table 7). All other access on upper Fall River is via Rick's Lodge, a private resort, or through permission of private land owners.

Limited public access on upper Fall River has affected fishing patterns: Creel census data shows most anglers put in and take out at the same location and fish sections of the river adjacent to their launch location. Most gas engine use in the upper areas of the river originates from anglers who have launched at the PG&E dredge. The limited access results in unneeded traffic that detracts from the fishing experience and, for gasoline powered boats, contributes to bank erosion.

There is little opportunity for a drift or one-way fishery from public access points although this kind of opportunity has been more available to persons who launch at Rick's or other upstream private property. For example in 1978 and 1982 very few anglers that launched from Island Road Bridge or from the PG&E dredge site took their boat out at the other public site whereas 13 to 20% of the anglers launching at Rick's or from private property took their boat out at another location (Table 8).

Opponents of increased upstream public access, most of whom are anglers who have private access to the river, feel that additional access will increase fishing pressure and have an adverse impact on the quality of the fishing experience.

The most likely location for an access site in the upper area of the river is at the PG&E gasline crossing. The September 4, 1984 public review draft of this management plan proposed an access at this gasline site with the following potential restrictions:

1. Parking should be restricted to not more than ten vehicles.
2. Trailers and trailered boats should be prohibited.
3. The use of gasoline powered boats should be discouraged.
4. No overnight parking of vehicles or boats (including no overnight boat parking on the river at this location).
5. The access should be closed to all public use when the fishing season is closed (this will reduce the potential for the access to affect trespass by hunters in this area where the river is very narrow and difficult to hunt without trespass).
6. The access should be marked with a small sign on Road A-19 similar to street name signs used in the area; no directional signs should be placed on Highway 299.
7. Electronic car counters should be installed to monitor use and use changes that would suggest the need to evaluate fishery impacts and restriction needs.

Even with these proposed restrictions, most of the public review draft comment concerning this issue was opposed to access development at the gasline crossing. It was also suggested that access restrictions be adjusted to allow not more than 10 boats on the river from this access and that such a goal might require substantially fewer parking spaces plus special consideration of commercial type uses and shuttle services.

In view of the opposition to this access site and considering the complexities of managing use, it appears that development of access at the gasline crossing site should be delayed unless other changes in access suggests a need for more immediate attention. In the future, there may be less controversy associated with access development at the gasline site particularly if angling regulation changes and streambank protection tend to improve the downstream fishery more than the upstream fishery.

Recommendation 10: Development of public access at the gasoline crossing site should be considered in the future after angling regulations and environmental protection measures are instituted and evaluated or if public access needs change.

Recommendation 11: The Department of Fish and Game should attempt to acquire the California Trout Island Road Bridge access site if Cal Trout should put that property up for sale and maintain restrictions on use similar to existing restrictions.

Public ownership of the Island Road Bridge access site would insure continued public access. Access restrictions will prevent any major changes from present use patterns.

Recommendation 12: Potential conflicts with public access and private land owners at the PG&E dredge site should be resolved by means such as land acquisition and fencing or by provision of an alternate site in the vicinity.

Public use of the dredger site access has caused the private landowners to be concerned about liability, vandalism, gates left open, litter and similar problems. Public purchase and fencing of a small parcel in this area would resolve such problems and provide compensation to the landowners for their land.

Recommendation 13: Provide sanitary facilities and trash collection at all major public boat access sites.

Provision of sanitary facilities and trash collection at major public access points will help protect the values of Fall River and adjacent lands.

Rice Farming

Cultivation of wild rice is a relatively recent agricultural activity in Fall River Valley. Wild rice acreage has increased from about 60 acres in 1982 to about 700 acres in 1984; further increases are anticipated. The growing of rice requires intensive flood irrigation. Irrigation return water, in addition to being possibly warmed and turbid, can carry nutrients and chemicals back into Fall River.

In response to public concerns regarding the possible effects of wild rice growing on Fall River water quality, a study was completed by the Central Valley Regional Water Quality Control Board in 1984 (Central Valley Regional Water Quality Control Board, 1985). At 1984 levels of cultivation, wild rice farming (mainly drainage) was found to have either unmeasurable or insignificant effects on the water quality of Fall River except when breached levees caused turbidity.

The 1985 Regional Board Report recommended: (1) the development of best management practices to guide the location of rice fields and the construction of levees (such practices were established in April, 1985); (2) strengthening of permit terms for the application of restricted materials; (3) Department of Fish and Game documentation

of changes in channels and aquatic growth through aerial photography (this photography has been scheduled); and (4) annual monitoring of rice drainage by the Regional Board.

Recommendation 14: Follow the recommendations of the Central Valley Regional Water Quality Control Board to help ensure that rice farming does not adversely impact the aquatic resources of Fall River.

Siltation From Bear Creek

Siltation originating from Bear Creek flood flows may be having a detrimental impact on the Fall River fishery through siltation of trout spawning gravels and impacts on aquatic vegetation and related aquatic insect production. Such impacts are difficult to assess but are certainly important. A recently completed Soil Conservation Service Basin Study (USDA, 1983) determined that sediment deposition in Fall River was significant only above Rick's Lodge and that the silt originated primarily from Bear Creek. Most Bear Creek silt probably originates from timber harvest operations and from roads in the drainage. Good road building and timber harvest practices should tend to minimize adverse impacts.

Recommendation 15: Review timber harvest plus road construction and maintenance activities in the Bear Creek drainage and make recommendations to minimize siltation.

Habitat Improvement and Trout Stocking

The foregoing recommendations are designed to maintain and restore habitat and maximize the opportunities for anglers to catch many large trout in the natural and productive Fall River. Potential to improve on the natural system exists through habitat improvement and trout stocking. The primary potential for habitat improvement would involve measures to increase food producing areas and trout cover, primarily in specific areas where habitat is deficient. This can be done by placing rocks on the stream bottom and anchoring logs in areas with little or no cover. The changed currents and locally created slack water will create diversity of habitat in areas with essentially bare uniform channels and new weed beds can be developed. This will fill in the gaps and make for more continuous maximum fish producing water which in turn will create a more continuous potential for prime fishing. Manipulation of existing spawning gravel and the addition of new gravels in selected locations can increase spawning potential.

Recommendation 16: Improve trout habitat in selected areas where deficiencies exist.

Recruitment may be limiting trout production in some reaches of Fall River, particularly in the reaches below Island Road Bridge where very few juvenile trout were seen during electrofishing. Such a deficiency could be corrected by stocking native wild strains of trout and/or increasing the potential for natural spawning. Since too much additional recruitment could increase trout population

numbers to the point where the growth rate of trout is decreased, it would appear best to approach such recruitment increases on an experimental and easily reversible basis through trout stocking (trout stocking can be easily discontinued whereas it would be difficult to remove spawning gravel). Experimental trout stocking should be considered primarily for river reaches with low numbers of small trout and with Fall River strain stocks if possible. Preference should be given to stocking fingerlings over larger yearling-size or "catchable-size" trout so that a put-and-take type fishery does not have the potential to develop and so the trout have all appearances of wild trout when caught. Trout stocking or spawning habitat improvements should be considered only after the trout population stabilizes following institution of the other recommendations, primarily those relating to angling regulations.

Recommendation 17: Consider increasing trout recruitment after the trout population stabilizes as the result of recommended angling regulation changes.

EVALUATION AND MONITORING PROGRAM

Evaluating and monitoring the effectiveness of this plan will involve many activities, the most important of which are listed below:

1. Fish Population Monitoring. The status of the fish population should be monitored each year at the gasline crossing section, Whipple section, and in a new "Shintaffer Ranch" section between the Island Road Bridge and the mouth of the Tule River. Emphasis should be on species composition and length frequency. Every 3 yrs., trout numbers should be estimated with mark and recapture techniques. Since it would be difficult to make mark and recapture population estimates for all three sections in the same year (because of the large amount of effort involved), consideration should be given to scheduling a population estimate on one section each year. Fish population sampling should be conducted in mid or late August each year when aquatic vegetation is abundant.
2. Trout Growth. Scale samples should be collected from trout at the gasline and Shintaffer Ranch sections in 1985, 1988 and 1991 to evaluate any changes in trout growth that might result from management and environmental changes. Samples should be collected during fish population sampling.
3. Creel Survey. A creel survey similar to that conducted in 1982 should be conducted in 1986 and 1989 to evaluate the "bottom line" of the management program, the fishery. Additional surveys should be scheduled as needs are identified.
4. Angler Use Index. Car counters should be placed on all major Fall River public boat access sites to provide an index of angler use. Major changes in the use index would suggest a need to examine other factors more closely and, possibly, schedule more population sampling and creel surveys.

5. Aerial Photography. An aerial photographic series of the river should be obtained in 1985, in both color and color infrared, to document the current status of the river, its channel characteristics, and aquatic vegetation. Photo series in subsequent years can be scheduled to document changes as necessary. These photos should be coordinated with on ground measurements, particularly of bank erosion.
6. Trout Tagging. Tagging of trout is not specifically recommended at this time, but could be scheduled in the future if additional information is necessary to evaluate harvest, mortality rates or trout movement.
7. Angling Regulation Enforcement. Enforcement of angling regulations will be accomplished to obtain a reasonable level of compliance in conformance with overall Department priorities.

COORDINATION SUGGESTIONS

The following agencies and groups should be involved in the development and implementation of this plan. The Department of Fish and Game should maintain coordination with these groups regarding activities or problems which may directly or indirectly affect the wild trout program:

Shasta County.....	Land use planning and zoning; restrictions on incompatible recreational uses; road and bridge maintenance; public access; pesticide and herbicide use and enforcement of boating regulations.
Pacific Gas & Electric Company...	Public access; hydropower project operation; dredging.
Contiguous Land Owners.....	Public access; control of streambank erosion; trespass; litter.
Wildlife Conservation Board.....	Public access; capital outlays.
Central Valley Regional Water Quality Control Board.....	Water Quality.
Soil Conservation Service.....	Soil erosion.
Shasta-Trinity National Forest...	Bear Creek Watershed Management.
California Department of Forestry.....	Timber harvest review and California Forest Improvement Projects.

Sportsmen and Sportsmen's
Organizations.....Management goals; public access;
habitat improvement; litter cleanup;
volunteer projects.

California Trout, Inc.....Operation of Island Road Bridge
access in conformance with this
plan's goals and possible future
public acquisition of Island Road
Bridge Access.

Federal Energy Regulatory
Commission.....Licensing procedures and review.

Colleges and Universities.....Biological data collection.

ACKNOWLEDGMENTS

A large number of individuals, including Department of Fish and Game employees, sportsmen and volunteers contributed to this study. We are particularly indebted to J. Deinstadt, D. Eoff, L. Simons, L. S. Simons, W. Snider, T. Stevens, Shasta Flyfishers and the Inter-mountain Sportsmen for assisting with the field work. K. McFarland and L. S. Simons spent considerable time on data compilation. We thank W. Snider for age and growth analysis and R. Carpenter for help in study design and data computerization. D. Huff provided a boat for creel census work. Our appreciation is extended to Z. Jensen, R. Piscatello, S. Shintaffer and M. Whipple for providing river access for survey crews during the study. Much thanks goes to the many individuals who provided comments on the draft of this report during the public review period. We thank J. Deinstadt, J. Hanson and C. von Geldern for critically reviewing the manuscript.

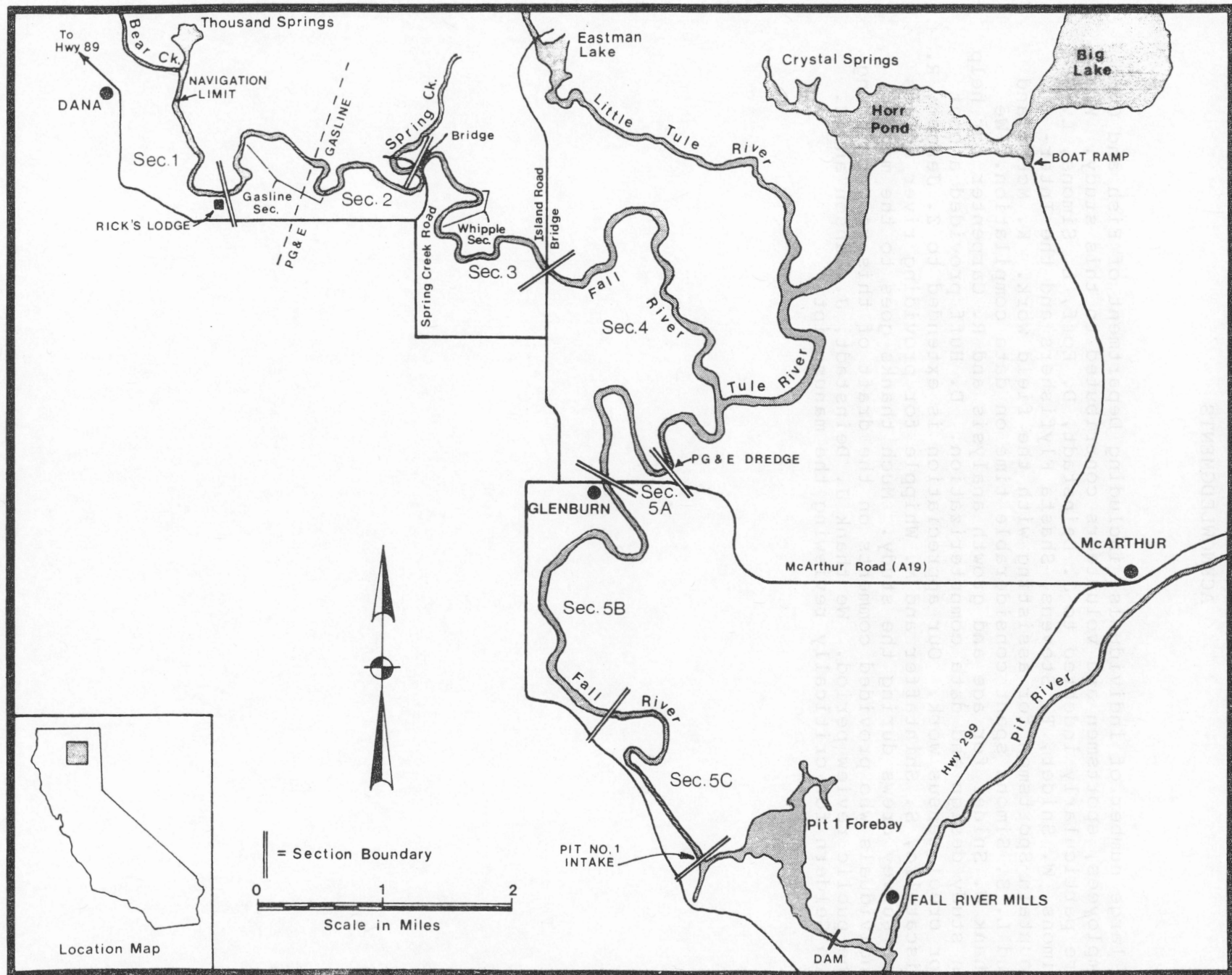


FIGURE 1. Map of Fall River and Vicinity.

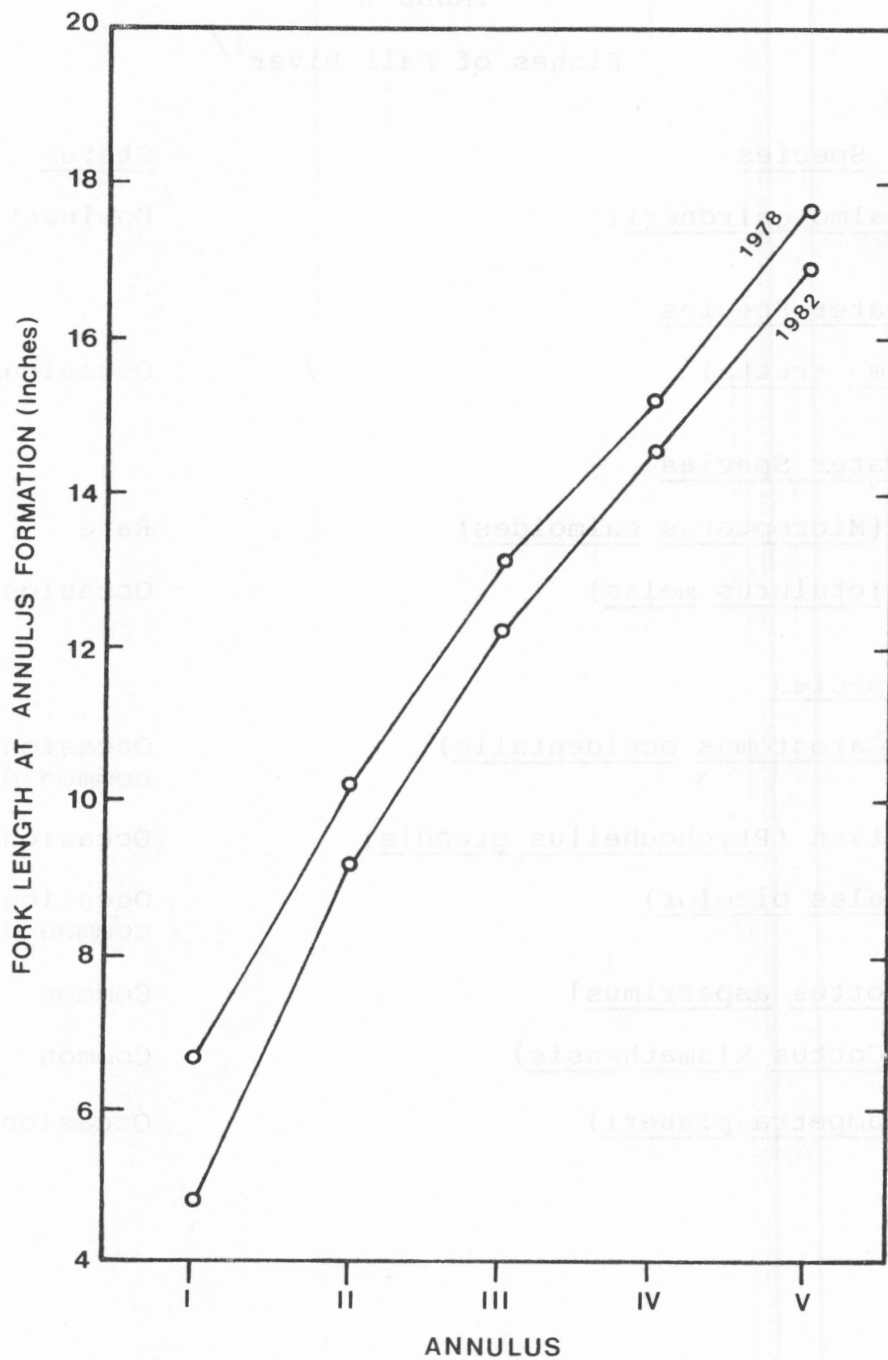


FIGURE 2. Fall River Rainbow Trout Growth Rates, 1978 and 1982.

TABLE 1
Fishes of Fall River^{1/}

<u>Native Coldwater Species</u>	<u>Status</u>
Rainbow trout (<u>Salmo gairdneri</u>)	Dominant trout species
<u>Introduced Coldwater Species</u>	
Brown trout (<u>Salmo trutta</u>)	Occasional
<u>Introduced Warmwater Species</u>	
Largemouth Bass (<u>Micropterus salmoides</u>)	Rare
Black bullhead (<u>Ictalurus melas</u>)	Occasional
<u>Native Nongame Species</u>	
Western sucker (<u>Catostomus occidentalis</u>)	Occasional upstream, common downstream
Sacramento squawfish (<u>Ptychocheilus grandis</u>)	Occasional
Tui chub (<u>Siphateles bicolor</u>)	Occasional upstream, common downstream
Rough sculpin (<u>Cottus asperimus</u>)	Common
Marble sculpin (<u>Cottus klamathensis</u>)	Common
Brook lamprey (<u>Lampetra planeri</u>)	Occasional

^{1/} Above Pit No. 1 Powerhouse Intake

TABLE 2
Species Composition, Fall River, 1975 to 1983
in the Gasline Section, and 1978 to 1983 in the Whipple Section

SPECIES (%)

	<u>Rainbow Trout</u>	<u>Brown Trout</u>	<u>Western Sucker</u>	<u>Tui Chub</u>	<u>Sacramento Squawfish</u>
Average	91	4	4	1	<1
Range	80-95	2-9	2-11	0-2	0-<1
Average	71	1	11	18	<1
Range	61-78	<1-1	2-23	6-31	0-1

TABLE 3

Fall River Rainbow Trout Population Estimates^{a/} and
Percentage of Population Over 14 In. F.L., 1975-83

Year	Petersen Population Estimate (Trout per mile ^{a/})		% Sample 14+ in. ^{a/}		% Sample 20+in. ^{a/}	
	Gasline	Whipple	Gasline	Whipple	Gasline	Whipple
1975	4089		3.4			
1976	2287		4.4			
1977	3220		4.0			
1978	3033	1643	11.4	34.1	0.2	0.3
1979			11.1	22.5	0.0	0.0
1980			17.3	18.0	0.0	0.0
1981			23.2	17.9	0.3	0.0
1982			41.1	39.0	0.0	0.0
1983	1846	3390	31.5	28.8	0.0	0.0

^{a/} Rainbow trout over 6 inches long only

TABLE 4
Rainbow Trout Growth Comparisons

Stream	Year	Average Length at Annulus Formation (Inches)				
		I	II	III	IV	V
Hat Creek ^{a/}	1978	5.5	9.7	12.7	15.2	--
Lower McCloud R. ^{a/}	1978	3.7	7.8	11.4	15.0	16.9
Upper Sacramento R. ^{a/}	1978	4.0	8.2	12.0	14.7	--
Fall River ^{a/}	1978	6.7	10.2	13.1	15.2	17.6
Fall River ^{b/}	1982	4.8	9.2	12.2	14.6	16.9

^{a/}Data from Snider (1981)

^{b/}Data from John Deinstadt (personal communication)

TABLE 5

Origin (Residence) of Anglers Fishing
Fall River in 1978 and 1982

Angler Origin (%)

<u>Year</u>	<u>Local</u> ^{a/}	<u>Other Shasta Co.</u>	<u>Non-Shasta Co.</u>
1978	13	4	83
1982	12	6	82

^{a/} Local includes that area roughly from Fall River Mills through Burney, including Pitville, McArthur, Glenburn, Dana, Cassel, and Johnson Park

TABLE 6

Gasoline Engine Use by Boat
Anglers Fishing Fall River in 1978 and 1982

Year	Gas Engine Use (%)					Summary		Average
	1 Nav. Limit to Rick's Lodge	2 Rick's Lodge to Spring Ck. Br.	Section 3 Spring Ck. Br. to Island Rd. Br.	4 Island Rd. Br. to PG&E Dredge	5 PG&E Dredge to Glenburn Br.	ABOVE Island Rd. Br.	BELOW Island Rd. Br.	
1978	0	5	15	60	76	9	62	20

1982	3	6	5	57	82	5	58	21
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TABLE 7

Boat Angler Distribution
From The Three Primary Boat Launching Sites
Fall River, 1978 and 1982

Section Fished (%)

Launch Origin	Year	1	2	3	4	5	TOTAL
		Nav. Limit to Rick's Lodge	Rick's Lodge to Spring Crk. Br.	Spring Ck. Br. to Island Rd. Br.	Island Rd. Br. to Mo. Tule R.	Mo. Tule R. to Glenburn Br.	
Rick's Lodge	1978	34	55	10	1	0	100
	1982	36	63	1	0	0	100
Island Road	1978	0	3	66	31	0	100
	1982	0	2	82	16	0	100
PG&E Dredge Site	1978	0	0	15	72	13	100
	1982	0	1	3	84	12	100

TABLE 8

Boat Take-out Locations for Anglers
 Launching at Three Major Accesses and From Private Property
 Fall River, 1978 and 1982

		TAKE-OUT LOCATION (percent of total from each launch origin)				
<u>Launch Origin</u>	<u>Year</u>	<u>Rick's Lodge</u>	<u>Island Road</u>	<u>PG&E Dredge</u>	<u>Private Property</u>	<u>TOTAL</u>
Rick's Lodge	1978	86	14	0	0	100
	1982	83	15	0	2	100
Island Road	1978	0	94	5	1	100
	1982	0	100	0	0	100
PG&E Dredge Site	1978	0	7	93	0	100
	1982	0	0	100	0	100
Private Property	1978	1	10	9	80	100
	1982	1	12	0	87	100

TABLE 9
Use of Artificial Lures, Bait, and
Artificial Lure-Combinations,
Above and Below Island Road Bridge
Fall River, 1978 and 1982

Location	GEAR DISTRIBUTION (%)					
	Artificials Only		Bait Only		Combinations (Artificial Lures & Bait)	
	1978	1982	1978	1982	1978	1982
Above Island Road Bridge	100.0	99.8	0.0	0.2 ^{a/}	0.0	0.0
Below Island Road Bridge	69.8	44.2	18.8	39.1	11.4	16.7
River above Glenburn Average ^{b/}	92.5	82.4	4.7	12.3	2.8	5.3

^{a/} Anglers fishing illegally.

^{b/} Average weighed by number of anglers checked in each area. Since most sampling was done above Glenburn, the average primarily represents the river above Glenburn to the limit of navigation.

TABLE 10

Catch By Gear Types, Fall River, 1978 and 1982

Gear Type	Year	Percent of Total Catch ^{1a/}		Percent of Total Kept Catch		Percent of Own Catch Kept	
		1978	1982	1978	1982	1978	1982
Artificials		95.4	80.9	83.9	33.8	9.3	8.6
Bait		3.0	14.3	10.6	51.8	37.0	74.2
Combinations		1.6	4.8	5.5	14.2	37.5	61.9
TOTAL		100	100	100	100	--	--

^{a/} Total catch includes those released plus those kept.

TABLE 11

Fall River Creel Survey Summary^{a/}
1978 and 1982

Year	Location	Anglers d) Interviewed	Hours d) Fished	Trout Kept		Trout Released		C/HR Kept & Released	Catch Released (percent)	Mean Length Rainbow Kept (inches)
1978	Above IRB b)	730	2289	88	0	1127	6	0.53	93	12.5
	Below IRB c)	243	680	73	0	236	0	0.45	76	12.8
	Total	973	2969	161	0	1363	6	0.52	89	12.6
1982	Above IRB b)	1064	3623	83	3	1030	1	0.31	92	13.3
	Below IRB c)	488	1291	200	3	233	0	0.34	53	13.6
	Total	1552	4914	283	6	1263	1	0.32	81	13.5

^{a/} Sample only; complete use and catch estimates not made^{b/} Above Island Road Bridge^{c/} Below Island Road Bridge^{d/} Studies were not designed to compare angler effort between years; the number of anglers and angler hours recorded in each year may be related to the number of days surveyed and survey methods.

TABLE 12

Percent of Rainbow 16 Inches FL or Greater
Fall River, 1978 and 1982

<u>Location</u>	<u>1978</u>	<u>1982</u>
Above Island Road Bridge	5	4
Below Island Road Bridge	13	13

TABLE 13

Distribution of Professionally Guided Anglers
Fishing Fall River in 1982

<u>Section Fished</u>	<u>Guided Anglers (% of Total Anglers Surveyed)</u>
1	15
2	15
3	22
4	6
5	0
Average	15

TABLE 14

Rainbow Trout Harvest^{a/} Rates
Fall River, 1978, 1979, 1980

<u>Area Tagged</u>	<u>Number Tagged</u>		<u>Harvest (%)</u>		
	<u>1978</u>	<u>1979</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
Section 2	257	0	3.5	3.8	3.8
Section 3	191	0	4.7	4.9	5.3
Section 4	76	42	11.8	9.5	10.0
Section 5A	42	47	16.7	21.3	22.2
Section 5B	10	52	10.0	9.6	10.3
Section 5C	14	63	21.4	17.5	18.8
<u>TOTALS</u>					
Above Island Rd.Br.	448	0	4.0	4.2	4.5
Below Island Rd.Br.	142	204	14.1	19.5	16.7
All Sections	590	204	6.4	6.8	7.1

^{a/} Harvest includes only fish that anglers said they would have kept had the fish not been tagged.

TABLE 15

Rainbow Trout
First Year Harvest^a/For Different Size Classes,
Fall River, 1978 and 1979
(% in parentheses)

Size Range Fork Length (In.)	Above Island Road		Below Island Road		Total # Harvest
	# Tagged	# Harvest	# Tagged	# Harvest	
<12.0	300	10 (3.3)	170	19 (11.2)	29 (6.2)
12.1 - 13.9	104	4 (3.8)	88	12 (13.6)	16 (8.3)
14.0 - 15.9	33	2 (6.1)	59	15 (25.4)	17 (18.5)
≥ 16.0	10	2 (20.0)	29	4 (13.8)	6 (15.4)
TOTAL	447	18 (4.0)	346	50 (14.5)	68 (8.6)

^a/ Harvest includes only fish that anglers said they would have kept had the fish not been tagged.

TABLE 16. Number (Percent) of Reward Tag Returns by Capture Location, Fall River, 1978-81

Capture Location ^{a/}	SECTION ^{a/} TAGGED							Total Returns
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5A</u>	<u>5B</u>	<u>5C</u>	
Bear Creek			1(3.2)					1
Sec. 1		2(5.6)						2
Sec. 2		<u>23(63.9)</u>	2(6.5)					25
Sec. 3		3(8.3)	<u>19(61.3)</u>	2(7.4)	8(23.5)	1(5.6)	5(16.7)	38
Sec. 4		3(8.3)	6(19.4)	<u>17(63.0)</u>	10(29.4)	6(33.3)	6(20.0)	48
Sec. 5A		1(2.8)	1(3.2)	4(14.8)	<u>11(32.4)</u>	2(11.1)	1(3.3)	20
Sec. 5B			1(3.2)	2(7.4)	1(2.9)	<u>7(38.9)</u>	2(6.6)	13
Sec. 5C		2(5.6)			1(2.9)	2(11.1)	<u>15(50)</u>	20
Tule River System ^{b/}		2(5.6)	1(3.2)	2(7.4)	3(8.8)		1(3.3)	9
TOTAL RETURNS	36(100)	31(100)	27(100)	34(100)	18(100)	30(100)		176

^{a/} Returns are underlined for captures in the same section where tagged.
See Figure 1 for section designation.

^{b/} Includes Tule River, Little Tule River, Eastman Lake, Horr Pond & Big Lake

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