

CASE STUDY REPORT #13
SCOTT DAM (LAKE PILLSBURY)
EEL RIVER

I. Project Description

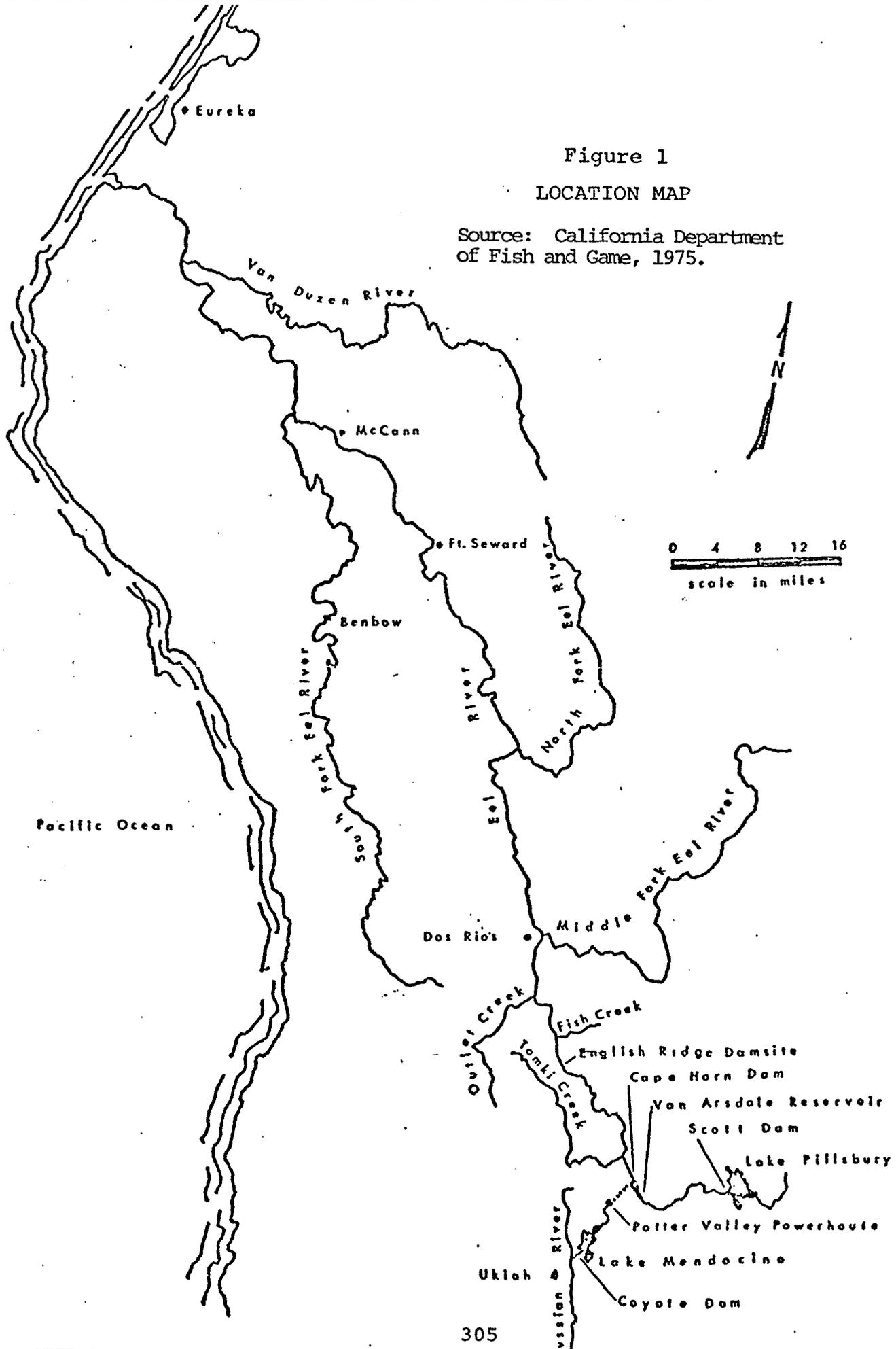
Scott Dam (Lake Pillsbury) is located on the main stem of the Eel River, 11 miles upstream of Cape Horn Dam (Case Study Report #13). Scott Dam was built as part of the Potter Valley Power Project in 1922 (Scott and Cape Horn and one powerhouse in Potter Valley). Cape Horn Dam has been diverting Eel River water into the Russian River drainage since 1908 through a diversion tunnel and hydroelectric power plant located in Potter Valley on the East Fork of the Russian River (Figure 1).

Snow Mountain Water and Power Company built all three components of the power development which the Federal Power Commission (FPC) licensed in 1922 as FPC 77 for a term of 50 years.

Lake Pillsbury undergoes extreme annual fluctuations. This is the result of hot dry summers, cool wet winters and a downstream water demand for power and irrigation. During the 1968 water year, reservoir volumes ranged from 11,000 acre-feet on November 28 to 86,800 acre-feet on May 29. The reservoir has a maximum storage capacity of 86,800 acre-feet covering 2,003 acres.

Figure 1
LOCATION MAP

Source: California Department
of Fish and Game, 1975.



Scott Dam discharges water at the base of the dam with a maximum outflow of 355 cubic feet per second (cfs). The diversion tunnel, at Cape Horn Dam 11 miles downstream, has a maximum capacity of 400 cfs. During some years, water may overflow through a spillway.

II. Pre-Project Condition

Sixteen species of freshwater and anadromous fish are known to occur in the Eel River drainage (Brown & Haley, 1974) (see Table 1). The principal commercial and game fish reaching the project area were king salmon and steelhead. Since the construction of Cape Horn Dam, the anadromous fish run has been generally limited to steelhead trout. The Department of Fish and Game estimated that 50 to 75 miles of stream habitat above the Scott Dam site was available to salmon and steelhead. The size of the king salmon run above the Cape Horn Dam site prior to 1907 is unknown but was estimated by Department of Fish and Game to be 4,000 fish annually. As with king salmon, the size of the steelhead and silver salmon run prior to the construction of the dam is unknown.

Streamflow patterns in the upper Eel River correspond to seasonal fluctuations in rainfall. The wet season or period of high streamflow begins with the first major rains, usually in November or December, and continues through May. The period from December 1 through May 31 includes 92.9 percent of the

Table 1

KNOWN ANADROMOUS AND FRESHWATER FISH SPECIES PRESENT
IN THE EEL RIVER DRAINAGE

Common Name	Scientific Name
Pacific lamprey	<u>Entrosphenus tridentatus</u>
Green sturgeon	<u>Acipenser medirostris</u>
* American shad	<u>Alosa sapidissima</u>
King salmon	<u>Oncorhynchus tshawytscha</u>
Silver salmon	<u>Oncorhynchus kisutch</u>
Steelhead trout	<u>Salmo gairdneri</u>
Coastal cutthroat trout	<u>Salmo clarki</u>
* Sacramento western roach	<u>Hesperoleucus symmetricus</u>
* Golden shiner	<u>Notemigonus crysoleucas</u>
Western sucker	<u>Catostomus occidentalis</u>
* Brown bullhead	<u>Ictalurus nebulosus</u>
Threespine stickleback	<u>Gasterosteus aculeatus</u>
* Green sunfish	<u>Lepomis cyanellus</u>
* Bluegill	<u>Lepomis macrochirus</u>
Aleutian sculpin	<u>Cottus aleuticus</u>
Prickly sculpin	<u>Cottus asper</u>

* Introduced species.

Source: Department of Fish and Game, 1975.

unimpaired mean annual runoff as measured at Cape Horn Dam. The dry season or period of low flows extends through the balance of the year.

The computed unimpaired (natural) flow of the Eel River from 1910 through 1960 at Cape Horn Dam (11.5 miles below Scott Dam) is shown in the pre-project hydrograph (Figure 2). This data is from flows computed by Department of Water Resources (1969). Monthly estimates of the natural flow at Scott Dam have not been found.

III. Project Development

The Pacific Gas and Electric Company (PG&E) acquired the hydroelectric complex and accompanying Eel River water rights in 1930 from the Snow Mountain Water and Power Company. Water rights for PG&E on the Eel River consisted of all flows except a minimum of 2 cfs released from Cape Horn Dam at all times for downstream water users.

PG&E has applied for a new 50-year license (April 1970) that proposed to maintain existing operational procedures for the project.

In April of 1972, the FPC license issued to Snow Mountain Water and Power Company expired. PG&E has continued operations of the project (FPC 77) under annual renewals of their old license. One month before the license expired, the Department of Fish and Game submitted a report (Anderson, 1972) to the FPC recommending that certain flow releases and changes in

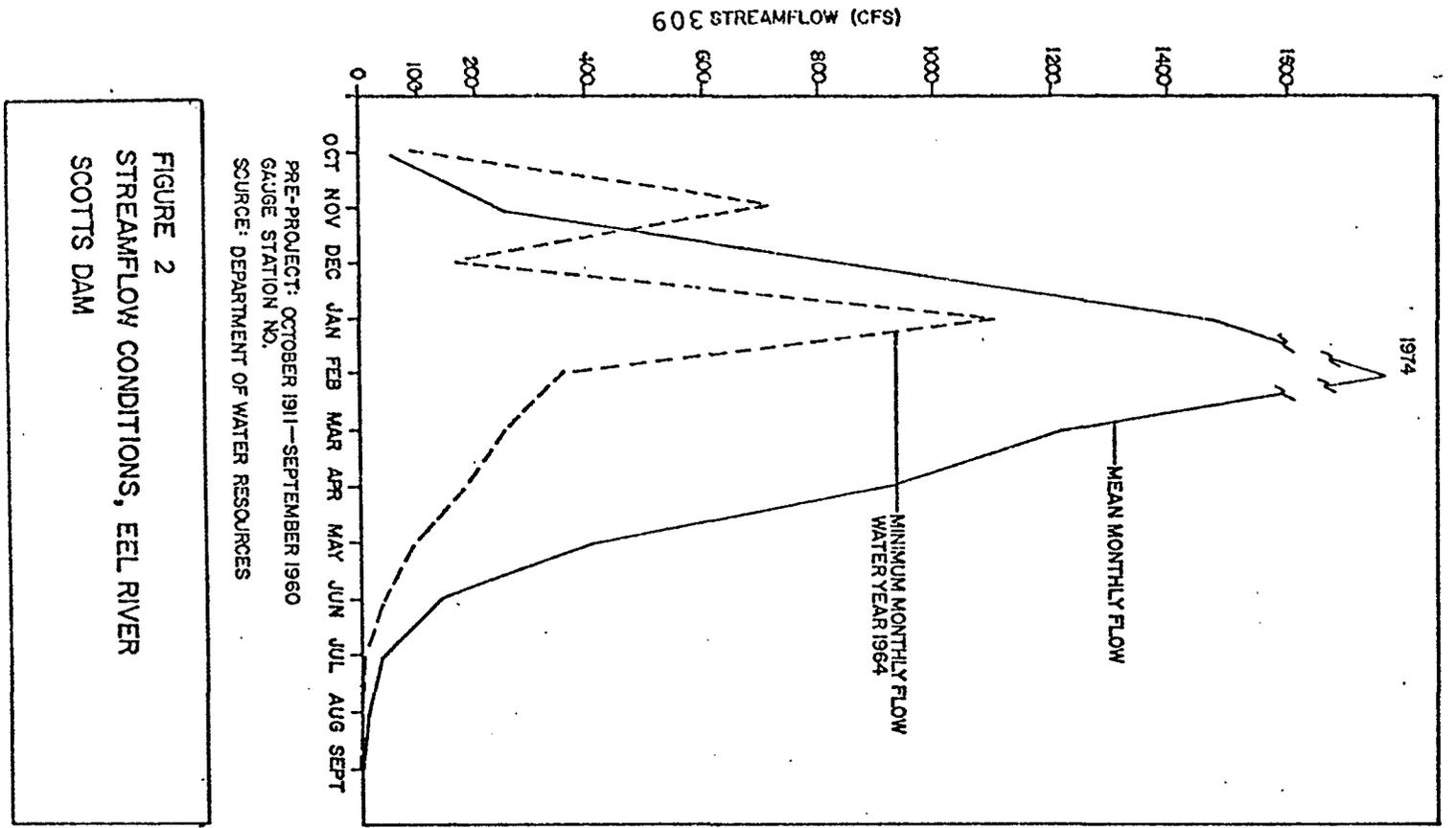
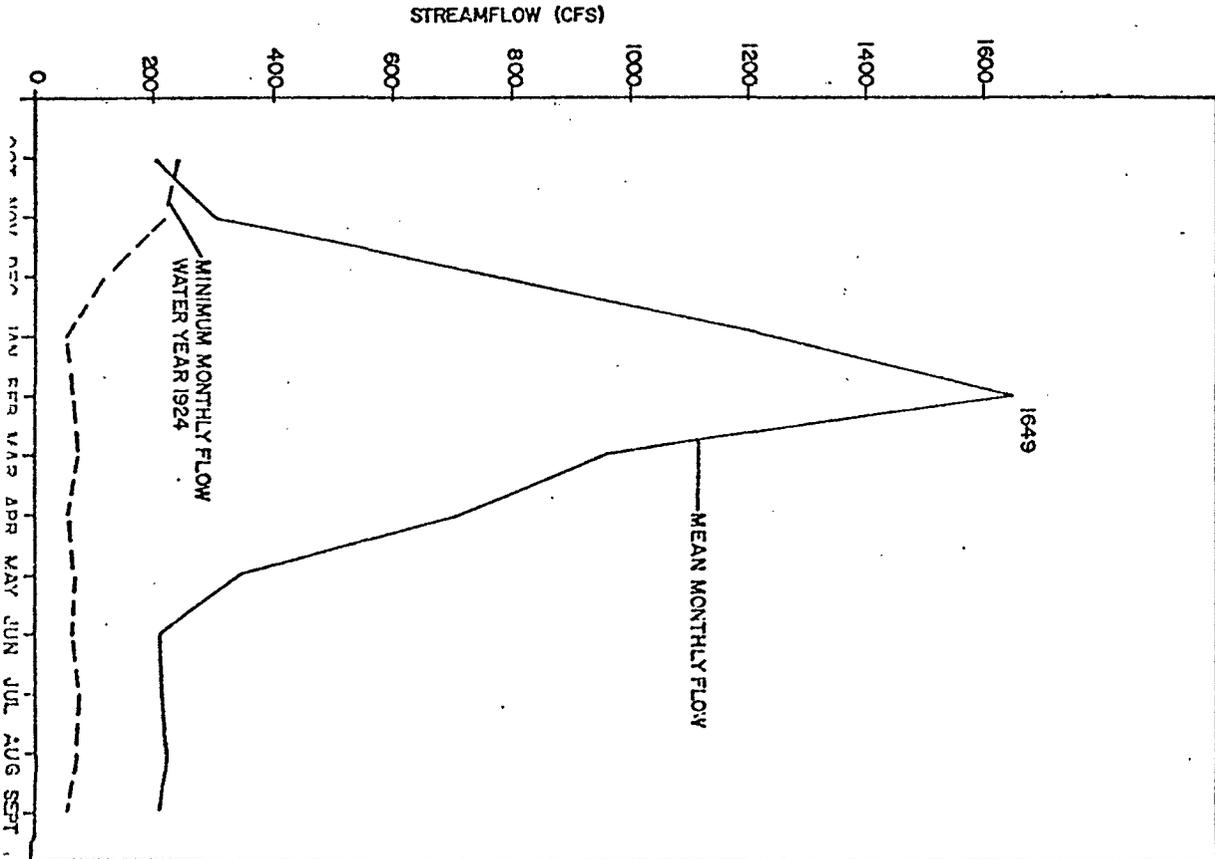


FIGURE 2
STREAMFLOW CONDITIONS, EEL RIVER
SCOTTS DAM



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operating procedures be incorporated into the terms of the new FPC license. These recommendations were primarily designed to help solve the major fishery problems associated with the project below Cape Horn Dam, such as dewatering of the Eel River and rehabilitating the anadromous fisheries resources of the Eel River.

In 1959, the Sonoma County Flood Control and Water Conservation District (now the Sonoma County Water Agency) and the Russian River Flood Control and Water Conservation District applied for appropriative water rights in the amount of 93,700 acre-feet per annum by storage and 345 cubic feet per second by direct diversion from the Eel River. These applications were subsequently held in abeyance by the State Water Resources Control Board pending the FPC's decision on the relicensing of the Potter Valley project.

As a result of the demands being placed on Eel River water, Humboldt County and the Eel River Water Council requested a study to investigate ways of improving flows in the Eel River for the enhancement of fisheries. An interagency study committee was formed to direct the study (for a further description, see Cape Horn Case Study). In February of 1975, the Department of Fish and Game submitted a report titled Eel-Russian River Stream-flow Augmentation Study: Reconnaissance Fisheries Evaluation. This study summarized and recommended the most acceptable operating plan for the enhancement of the fisheries affected by the Potter Valley Power Complex. The study also presented interim

measures for short term relicensing of FPC 77. These recommendations superseded the March 1972 recommendations. The present recommended flow requirements at Scott Dam are presented below.

Release in cfs when the cumulative runoff
of the Eel River at Van Arsdale Dam is:

<u>Time Period</u>	<u>More than 40 percent of normal</u> ^{a/}	<u>Between 20 and 40 percent of normal</u>	<u>Less than 20 percent of normal</u>
February	150	75	5
March 1-15	250	75	5
March 16-31	250-205 ^{b/}	75	5
April	205-114 ^{b/}	75	5
May	114- 20 ^{b/}	75- 10 ^{b/}	5
June	20	10	5
July	20	10	5
August	20	10	5
September	20	10	5
October	20	10	5
November	20-150 ^{c/}	10-150 ^{c/}	5-150 ^{c/}
December	20-150	10-150	5-150
January	20-150	10-150	5-150

a/ Long-term unimpaired runoff .

b/ Flow to decrease in uniform increments from the higher to the lower value through the indicated time period.

c/ Increase in releases to be initiated on or after November 1 when spills from Van Arsdale Dam cause the mean daily flow at the gaging station below Van Arsdale Dam to exceed 100 cfs.

Further recommendations of the Department of Fish and Game concerning Scott Dam are:

1. A salmon and steelhead hatchery should be constructed on the upper Eel River to mitigate the loss of spawning habitat caused by the blockage and inundation of the Eel River above Scott Dam.

2. Spring flow releases at Scott Dam should be conducted in a manner to stimulate and assist the downstream migration of steelhead.

The Department of Fish and Game recommended flow schedule is in excess of current project releases and would require a different mode of operation for the existing Lake Pillsbury facilities. Under this flow schedule, releases during periods of salmon and steelhead upstream migration and spawning would be increased and maintained at the minimum acceptable level in the Eel River below Scott Dam and Van Arsdale Reservoir (Department of Fish and Game, 1975).

Wintertime releases at Scott Dam coupled with Department of Fish and Game recommended releases at Cape Horn Dam would stimulate upstream migration of salmon and steelhead by providing attraction flows, transportation flows, and spawning habitat on the Eel River below Scott Dam.

Recommended springtime releases for the same area would be increased to help stimulate downstream migration of steelhead smolts and juvenile salmon. Post-project studies conducted by the Department of Fish and Game investigating the times of seaward migration, and the temperature regimes along the Eel River, indicate that springtime releases and temperature control may be the most important factor in successfully rehabilitating salmon and steelhead runs (Department of Fish and Game, 1975).

IV. Post-Project

The Eel River below Scott Dam traverses 11.5 miles of salmon and steelhead spawning habitat before encountering Van Arsdale Reservoir. Along this segment of the Eel River, there are three major tributary streams, the lower reaches of which can support salmon spawning.

Access to this segment of the river above Cape Horn Dam is provided by a fishway. Available counts of salmon and steelhead ascending the fishway begin in 1933 and show a general decline in numbers of both salmon and steelhead. The Department of Fish and Game's (February 1975) reasons for the decline in fish numbers using the river between Scott Dam and Van Arsdale are:

1. Releases below Van Arsdale Reservoir of 2 cfs to satisfy downstream water rights are inadequate for upstream migration past Cape Horn Dam. The problem is occurring this spawning season (winter 1975) so operational procedures remain unchanged (Baker, pers. comm.).
2. Flows that provided passage in the period before Scott Dam (1922) are impounded in Lake Pillsbury along with regulation and diversion of additional water out of the Eel River drainage at Cape Horn.
3. An absence of flows from increased runoff during the first major storms deprive steelhead and especially king salmon of the needed stimulation for upstream migration.

Good spawning and nursery conditions exist above Van Arsdale Reservoir and up to Scott Dam. This is due to the presence of good year-round flow releases, adequate temperatures, spawning gravel and cover. Presently there is evidence that temperature conditions exist below Scott Dam later in the year which are detrimental to juvenile stages of anadromous fish.

Trapping studies conducted during 1961-62 (Day, 1968) have shown downstream migration from above Van Arsdale may be delayed as much as 2 months for juvenile steelhead. Prolonged, cool spring flows from Lake Pillsbury may be delaying the downstream migration of steelhead until July and August (when peak numbers were trapped). Reduced growth rates and impairment of the physiological process of smolting could be additional problems.

Downstream migration at this delayed date could subject fish to low flows and lethal temperatures farther toward the mouth of the Eel River. USGS stations at Van Arsdale, Dos Rios and Fort Steward show lethal temperatures above 75°F as early as June 15, depending upon stream flows. During the late summer, streamflows on the Eel River sometimes reach a minimum of 2 cfs below Cape Horn Dam.

The 11.5 mile segment of stream between Scott Dam and Cape Horn Dam provides a steelhead trout fishery in the summer. The Department of Fish and Game estimates for 1973 show 8,400

angler days expended on this fishery. The estimated catch of juvenile steelhead was 14,000 fish, the bulk of which are one and two year old fish. These are fish that would have good survival rates if allowed to migrate safely to the ocean.

The Department of Fish and Game in order to protect this resource, lowered the bag limit from ten fish to three fish in 1975. Today as a result of public demand, the bag limit was reinstated to ten (Baker, pers. comm.).

The salmon and steelhead habitat of the Eel River below Lake Pillsbury is adversely affected by the great amounts of suspended sediment present in the lake's overflow. This condition is primarily due to the unstable nature of the watershed in the vicinity of the lake and its tributaries.

Sediment inflow into Lake Pillsbury averaged 343,000 tons annually between 1921 and 1959; of this amount, 6 percent (or 21,000 tons annually) is carried downstream and is composed of clays, silts and fine sands (Anderson, 1972). Diversion of this water into the Russian River during the winter months has caused persistent turbidity below Lake Mendocino (see Case Study Report #15).

V. Conclusions

The operation of Scott Dam has produced stable year-round instream flows to the Cape Horn diversion dam where water is diverted to the Potter Valley power house in the Russian River drainage.

None of the storage in Lake Pillsbury is allocated for fish and wildlife needs and as a result, natural runoff that historically supported large anadromous fish populations in the Upper Eel River is stored only for diversion to the Russian River basin. Because Scott Dam and the rest of the Potter Valley project did not consider fish and wildlife preservation from its inception, the fishery resources of the Upper Eel River are marginal and the altered streamflows create low water barriers to adult salmon migration, prevent successful spawning, and adversely affect the timing of juvenile salmon downstream migration. Also sediment production in the Upper Eel River watershed above Scott Dam has resulted in further deterioration of salmon and steelhead habitat in both the Eel and Russian Rivers.

The Federal Power Commission is in the process of relicensing PG&E's Potter Valley project which would determine the operation of Scott Dam in conjunction with Cape Horn Dam, the Potter Valley transbasin tunnel and power house (for a further description, see Cape Horn Case study Report No. 14).

Since 1972, the Department of Fish and Game has conducted two investigations (Department of Fish and Game, 1972 and 1975) which included temperature and instream studies to recommend the minimum instream flows and the operational alternative best suited to the preservation of fish and wildlife (for a further description of the operational alternatives reviewed, see Cape Horn Case Study Report No. 14).

At present another situation is arising concerning the Scott Dam component of the Potter Valley power project. The Department of Water Resources has proposed a dam site about 10 miles below the existing Scott Dam (just above Trout Creek on the upper Eel River). The final project proposal is not yet completed. The project was a result of a Department of Water Resources statewide hydroelectric power potential survey (Smith, pers. comm.).

Because there has been no change to date in the operating procedure of the Potter Valley project, it is not possible to analyze the effectiveness of the DFG recommendations, or methods used in deriving instream flow recommendations for rehabilitating and maintaining fisheries resources at the present time.

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