

PHYSICAL STREAM SURVEY  
UPPER BUTTE CREEK, BUTTE COUNTY, CALIFORNIA

For

The Nature Conservancy  
and  
The Spring-Run Salmon Working Group

Prepared by

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EXECUTIVE SUMMARY

This report is in response to an expressed need for fish habitat mapping on upper Butte Creek from the Centerville head dam to Butte Meadows, in Butte County, California. There was a need to know the answers to three questions. They are: 1) Is there any evidence that the waters above the location of the Centerville Diversion Dam on Butte Creek ever contained a population of Chinook Salmon? 2) What is the physical extent of natural holding pools and potential spawning gravel in the upper watershed? and 3) Are there natural barriers to fish migration in the upper portions of the creek?

The scope of this study included the following tasks. 1) Base maps were prepared at a scale of 1" = 100' for the creek from USGS 1:24,000 maps. Air photos and other available maps were also consulted. Field locations were verified on the maps by use of a Global Positioning System (GPS). 2) A field survey, using two to three mappers, was conducted in July and August 1995 from Butte Meadows, downstream 20.3 miles, to the Centerville Head Dam. Field notes delineated riffles, runs, rapids, suitable spawning gravel, holding pools, in-stream obstructions or barriers and other structure that would be important to migrating young and mature salmon. Water temperatures and stream flow rates were not measured. 3) Field data were transferred to the base maps and the mapped information was summarized. 4) A literature search and archival search as well as several interviews of knowledgeable people were conducted and the results of these investigations were summarized. Finally, 5) conclusions were drawn and this report was prepared.

The field survey mapped 3.9 miles of pools, 13.5 miles of runs, rapids and riffles, 2.9 miles of gravel beds and counted 35 barriers that could prove to be a hinderance to fish passage in low water. One natural barrier was noted to be high enough to block fish passage except in the very highest flow conditions.

It is concluded by this survey team that significant numbers of spring run salmon could negotiate the upper portion of Butte Creek in periods of high water particularly without loss of flows by diversions. In periods of average and low water, significant migration may be hindered by barriers unless some of those barriers could be modified by human action. With fairly minor barrier modification (blasting large boulders) the fish could migrate all the way to Butte Meadows in average flow years. Opening four miles of deep holding pools and three miles of spawning size gravel beds would create habitat for at least 3,000 spawning pairs.

There are no documented accounts of direct observation of Salmon above the location of the Centerville Head Dam nor is there any evidence that prehistoric peoples fished for salmon in the upper portions of the creek. While there is no conclusive evidence that there were spring run salmon in the upper reaches of Butte Creek there is also no conclusive evidence that there was not, at least, a small salmon population there. In high flow years salmon in deep holes in the rugged remote upstream areas could easily have gone undetected. It is logical to conclude that if nineteenth century occupants of the area wished to catch salmon they could and would do so in Centerville or Helltown where accessibility was much easier than the very rugged canyon above. Therefore, native fish could have occupied the upper portions of the canyon but were not sought after or their presence recorded by humans.

# UPPER BUTTE CREEK STREAM SURVEY

## Introduction

This report is in response to an expressed need by the Spring Run Salmon Working Group, The Nature Conservancy and others for fish habitat mapping on upper Butte Creek from the Centerville head dam to Butte Meadows, in Butte County, California. The need for this information is expressed in *Restoring Central Valley Streams: A Plan For Action* (DFG, 1993), *A Review of Butte Creek Fisheries Issues* (DFG, 1993) and *Working Paper On Restoration Needs: Habitat Restoration Actions To Double Natural Production Of Anadromous Fish In The Central Valley of California* (USFW, 1995).

Specifically, there was a need to know the answers to three questions. They are: 1) Is there any evidence that the waters above the location of the Centerville Diversion Dam on Butte Creek ever contained a population of Chinook Salmon? 2) What is the physical extent of natural holding pools and potential spawning gravel in the upper watershed? and 3) Are there natural barriers to fish migration in the upper portions of the creek?

## Methodology

In order to answer these questions the scope of this study included the following tasks. 1) Base maps were prepared at a scale of 1" = 100' for the creek from USGS 1:24,000 maps. Air photos and other available maps were also consulted. Field locations were verified on the maps by use of a Global Positioning System (GPS). 2) A field survey, using two to three mappers, was conducted in July and August 1995 from Butte Meadows, downstream 20.3 miles, to the Centerville Head Dam. Field notes delineated riffles, runs, rapids, suitable spawning gravel, holding pools, in-stream obstructions or barriers and other structure that would be important to migrating young and mature salmon. Water temperatures and stream flow rates were not measured. 3) Field data were transferred to the base maps and the mapped information was summarized. 4) A literature search and archival search as well as several interviews of knowledgeable people were conducted and the results of these investigations were summarized. Finally, 5) conclusions were drawn and this report was prepared.

The investigators believe that the information gathered and presented here will be suitable for implementing solutions to problems numbers 1 and 12 in *A Review of Butte Creek Fisheries Issues*, which call for removal of migratory obstructions at the Centerville Head Dam and placement of spawning-size gravel below summer holding pools.

## General Description of the Upper Butte Creek Study Area

For descriptive purposes the creek was divided into six segments. This survey began at Butte Meadows where the road to Magalia, (A-Line), crosses the creek. From this point Segment #1 extends downstream to what is here named the F-line waterfall. The stream bed consists of gravel beds, riffles and a few pools. It supports a quite viable trout population as do all segments below. The lower parts of the segment contain several potential barriers which are here defined as

waterfalls over five feet in height. Segment #2 begins at the F-line waterfall, which is over twenty feet in height, and flows to a path that leads to the Sierra Pacific 40-F-1 Line. This segment exhibits a balance of pools and gravel with few barriers. Segment #3 runs from the 40-F-Line to the Butte Creek Head Dam which provides an inlet to the De Sabla Reservoir. This segment has very steep sided canyon walls and is strewn with very large boulders. The stream in this segment consists mostly of runs and pools with little gravel and few riffles. The reservoir behind the head dam is filled with rubble and gravel. When built it may have held as much as five to ten acre feet of water. Segment #4 begins at the foot of the head dam and flows to a path that accesses the Sierra Pacific 80-F-7 Line. It has no significant barriers and has an adequate balance of spawning gravel and holding pools. Segment #5 extends from the 80-F-7 Line access point, past the Forks of the Butte, to the Ponderosa Way (Garland Rd.) bridge. This segment also has no significant barriers and holds many pools interspersed with gravel beds. Segment #6 extends from the Garland Road bridge to the Centerville Head Dam which is one quarter mile downstream from the De Sabla and Forks of the Butte powerhouses. This segment of the canyon is less steep sided but contains several obstructions that could prohibit fish passage in low water conditions. The remainder of the creek from the Centerville head dam to the barrier upstream of Chimney Rock was not surveyed because it was known to have salmon populations as was demonstrated in two 1995 Spring-Run Snorkel Surveys (Hill, 1995).

Within this portion of the Butte Creek watershed are several structures currently operated and maintained by Pacific Gas and Electric for hydropower production. They include the Butte Creek Head Dam which diverts water into a flume that empties into De Sabla reservoir. From the reservoir water is dropped to the De Sabla Powerhouse one thousand feet below. The Forks of Butte diversion carries water in a flume that empties through a penstock at the Forks of Butte Powerhouse which is located adjacent to the De Sabla Powerhouse. The Centerville Head Dam lies just downstream from the De Sabla powerhouse outlet. The diversion here carries water by flume to the Centerville Powerhouse at the community of Centerville below the historic mining community of Helltown. All of these features are shown on the maps accompanying this report.

#### Analysis

The field survey mapped 3.9 miles of pools, 13.5 miles of runs, rapids and riffles, 2.9 miles of gravel beds and counted 35 barriers that could prove to be a hinderance to fish passage in low water. One natural barrier was noted to be high enough to block fish passage except in the very highest flow conditions. The results are shown in Table 1.

It appears that the best segments for supporting salmon spawning are # 4 and #5 which have the highest percentage of gravel and the fewest barriers. Of all the segments, Segment #5 has the longest liner extent of gravel. Segment #6 has the largest number of pools but also a large number of barriers and is, unfortunately, the first segment to be encountered by upstream migrating fish.

Upper Butte Creek Habitat Inventory (measured in feet along length of stream)										
Segment	# Barriers	# Pools	Riffles	Rapids	Runs	Gravel	Pool	Total Length (feet)	Notes	
1. Butte Meadows to waterfall	7	16	7,400 37.9%	2,100 10.8%	5,090 26.1%	2,960 15.2%	1,950 10%	19,500 3.7 mi	<ul style="list-style-type: none"> <li>•steep rapids</li> <li>•barriers but most passable</li> <li>•waterfall 20'</li> </ul>	
2. Waterfall to 40F.1 line	4	38	2,990 14.2%	3,580 17%	7,720 36.8%	2,850 13.6%	3,860 18.4%	21,000 3.9 mi	<ul style="list-style-type: none"> <li>•moderate gravel</li> <li>•barriers</li> </ul>	
3. 40F.1 line to Butte Creek Head Dam	5	27	580 7.5%	2,360 20.2%	6,080 52.0%	280 2.4%	2,100 17.9%	11,700 2.2 mi	<ul style="list-style-type: none"> <li>•steep and fast</li> <li>•very little gravel</li> </ul>	
4. Butte Creek Head Dam to 80F.7 line	0	27	3,200 23.4%	1,540 11.2%	2,720 19.9%	2,400 17.5%	3,840 28.0%	13,700 2.6 mi	<ul style="list-style-type: none"> <li>•best habitat</li> <li>•no barriers</li> </ul>	
5. 80F.7 line to Ponderosa Bridge	0	36	6,030 26.2%	1,960 8.5%	7,240 31.5%	4,620 20.2%	3,150 13.8%	23,000 4.3 mi	<ul style="list-style-type: none"> <li>•good habitat</li> <li>•no barriers</li> <li>•most pools</li> <li>•good gravel</li> </ul>	
6. Ponderosa Bridge to Centerville Head Dam	19	54	1,870 10.2%	3,940 21.3%	4,940 26.7%	2,030 10.9%	5,720 30.9%	18,500 3.5 mi	<ul style="list-style-type: none"> <li>•most difficult barriers</li> <li>•not much gravel</li> </ul>	
Total	35	198	22,370 20.8%	15,480 14.4%	33,790 31.5%	15,140 14.1%	20,620 19.2%	107,400 20.3 mi		

The seven barriers in Segment #1 range from 5 to 20 feet in height the largest being the aforementioned end point of segment one. The four barriers in Segment 2 range in height from 5 to 12 feet but are passible in high water. The five barriers in Segment #3 are from 5 to 10 feet and are also passible. The nineteen barriers in Segment #6 range from 5 to 18 feet and were sometimes formidable obstacles to the survey team. Persons particularly expert in the capabilities of migrating salmon should evaluate the barriers in this segment.

In general stream flows are higher upstream of the diversion for the De Sabla reservoir in Segment # 3, and the Forks of the Butte diversion in Segment 6 then re-enters the creek before encountering the Centerville diversion at the end of Segment #6. It is beyond the scope of this report to estimate the quantity of water that is diverted at these points and then returned to the creek downstream at the three power plants.

It is concluded by this survey team that significant numbers of spring run salmon could negotiate the upper portion of Butte Creek in periods of high water particularly without loss of flows by diversions. In periods of average and low water, significant migration may be hindered by barriers in Segment # 6 unless some of those barriers could be modified by human action. With fairly minor barrier modification (blasting large boulders) the fish could migrate all the way to Segment # 1 in average flow years. Opening four miles of deep holding pools and three miles of spawning size gravel beds would create habitat for at least 3,000 spawning pairs.

The USFW *Working Paper on Restoration Needs* recommends in its Action 7(b) that the fish passage below Centerville Diversion Dam be enhanced by modification of the barrier .5 mile below the dam (USFW, 1995, 3-Xb-110). The recommendation is accompanied by a predicted benefit as follows: "Unimpeded passage, either through installation of fish ladders or removal of dams, would provide additional habitat that is thought to have been historically utilized by salmon and steelhead" (USFW, 1995, 3-Xb-111).

#### Literature Search

Beginning in the spring of 1995 and continuing on through the fall a literature search was conducted to address two important concerns. The first task was to define how far upstream salmon were able to migrate prior to the construction of the Butte and Centerville dams. The second task was to locate estimates of the annual number of migrating salmon in upper Butte Creek, also before construction.

A wide variety of published literature was acquired and reviewed. Most was obtained through on-line references including: Stanford's Folio system and University of California's Melville system. Chico State University's Special Collections Department was able to provide specifically local information. The most specific information in special collections came from environmental impact reports prepared for the planned Forks of the Butte power plant. The California Resources Agency Library was consulted and unpublished state documents were obtained through the California State Library in Sacramento. Archived state documents, including memos

and memorandums, were searched; both at the State Archives building and at California Department of Fish and Game offices in Sacramento and Rancho Cordova. In the possibility of finding news about fish catches in upper Butte Creek, microfilmed editions of the Chico Enterprise and Record from around the turn of the century were reviewed.

Many interviews were conducted with persons knowledgeable about Butte Creek. Biologist from both California Department of Fish and Game and Pacific Gas and Electric provided information. Local historians, through their conversations with "old timers" in the area also, provided valuable information. Professional archaeologists and anthropologists were consulted, regarding the possibility of native Indians catching salmon in the study area.

#### Literature Search and Interview Findings

The oldest published information found comes from a Department of Fish and Game bulletin by G. H. Clark published in 1929. Clark stated that Butte Creek, "...has been known as a very fine salmon stream and as a good spawning ground." The Bulletin is accompanied by a rough map showing streams in the entire Sacramento Valley. Clark had manually placed "x's" on this map and labeled them "Available spawning ground." Butte Creek has nineteen such marks beginning at the convergence with the Sacramento River and extending up to Butte Meadows. In his text Clark contradicts what we now know as true by stating there is only a fall salmon run. This can be explained by the fact that Butte Creek salmon hold through the entire summer and spawn in the fall. Finally at the end Clark reiterates by saying, "As has been stated, the creek was formerly one of the best salmon streams, but because of the irrigation dams and low water the run has been almost destroyed." Unfortunately Clark did not offer us any fish population estimates in his report nor was he locationally specific about where he observed his fish.

All of the other reports about the presence of Salmon in Butte Creek were written long after the construction of the Centerville and De Sabla power plants and make no reference to any salmon in the upper portions of Butte Creek.

In 1977 State Fish and Game Biologists Richard Flint and Fred Meyer conducted research on the, "The De Sabla-Centerville Project and Its Impact on Fish and Wildlife" (Flint and Meyer, 1977). Both of the authors were known to be very knowledgeable about the Butte Creek Fishery. Included in the report is a year by year account of the size of the spring-run from 1954-1976. The largest year was 1960 with 21,900 (largest that we know of) and the smallest was 1976 with 46 (1966-76 no runs larger than 700). The following is their description of the salmon habitat:

Project dams and diversions in Butte Creek have had an adverse impact on spring-run salmon and steelhead. Both species originally migrated far into the canyon-- some steelhead probably going as far as Butte Meadows (R. Hallock, Citizens Advisory Committee, 1971, personal communication). The project has decreased flows in about 15 miles (24 km) of spawning and nursery areas for salmon and

steelhead in the reach from Butte Head Dam to Centerville. The unimpaired flow through the canyon once provided cool water in many large holes that could accommodate thousands of adult salmon. The steepness and remoteness of the canyon protected the fish from men, bears, and other predators. When autumn came, the salmon, unstressed by either warm water or human activity, moved to adjacent spawning gravels in good condition (Flint and Meyer, 1977, 14).

Flint and Meyer also stated in the same work that "Although cold water exists above De Sabla Powerhouse, few salmon negotiate the leap over the Centerville Head Dam. In 1975, however, two PG&E employees reported seeing two salmon leap the falls adjacent to the De Sabla Powerhouse [which is above the head dam] (Flint and Meyer, 1977, 16).

John Westlund from the Centerville Historical Society provided details from one of his numerous interviews with an old time resident of Butte Creek, Dan Warner (Westlund, 1995). Mr. Warner described how the salmon were only able to migrate up to a place he called the Quartz Bowl. The Quartz Bowl is a large pool approximately .5 miles upstream from Chimney Rock; the base of what is today a partial barrier 15+ ft high. He remembers there being thousands of salmon in the Quartz Bowl but, he believed, were unable to pass the barrier. Then sometime in the 1930's for unknown reasons, possibly mining, the barrier was dynamited. This allowed the fish to negotiate the barrier and progress up stream to the Centerville Head Dam.

In summary the spring-run chinook salmon prior to the construction of the De Sabla and Centerville Dams were concentrated below the Quartz Bowl area in most low water or normal water years. However, in high flow conditions salmon may have been dispersed throughout the entire reaches of Butte Creek. There are no documented accounts of direct observation of Salmon above the location of the Centerville Head Dam nor is there any evidence that prehistoric peoples fished for salmon in the upper portions of the creek. However, there is one hearsay account (Meyer and Flint) that salmon were observed at the location of the De Sabla powerhouse. There are no newspaper accounts or photographs of salmon catches in the upper creek. While there is no conclusive evidence that there were spring run salmon in the upper reaches of Butte Creek there is also no conclusive evidence that there was not, at least, a small salmon population there. In high flow years salmon in deep holes in the rugged remote upstream areas could easily have gone undetected. It is logical to conclude that if nineteenth century occupants of the area wished to catch salmon they could and would do so in Centerville or Helltown where accessibility was much easier than the very rugged canyon above. Therefore, native fish could have occupied the upper portions of the canyon but were not sought after or their presence recorded by humans.

It was learned recently that faculty and students at University of California, Davis have been working on an historical overview of Sacramento Valley salmon. Their as yet unpublished findings concur with the findings in this report.



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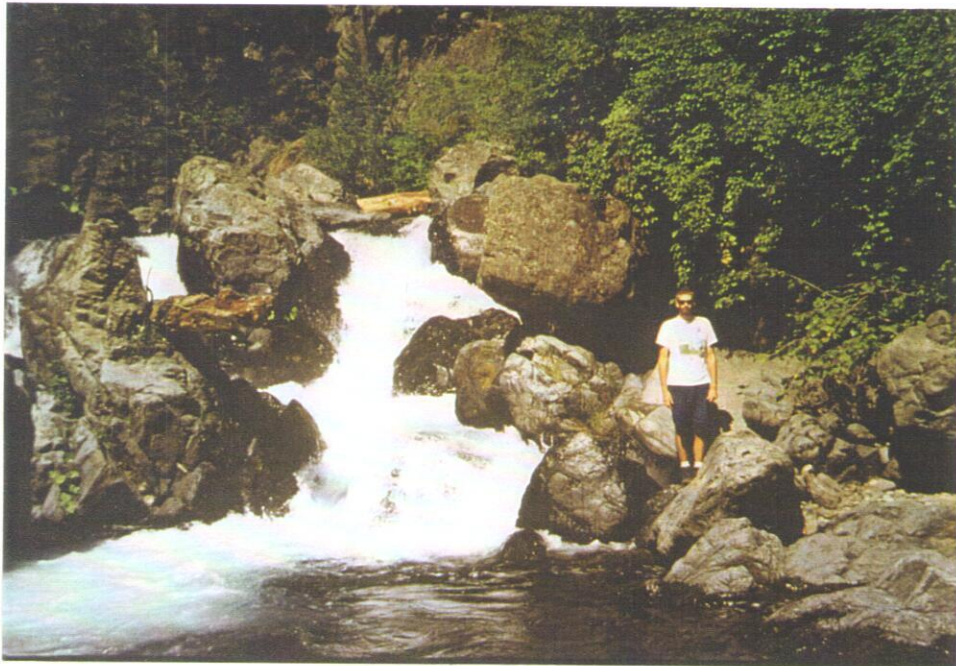
#### Personnel

The project manager for this report is Dr. Don Holtgrieve, professor of Geography and Environmental Studies at California State University, Chico. Field surveyors were: Randall Book, Jamie Calderon, Jeff Green, Gordon Holtgrieve and Bryan Taylor. The literature survey was conducted by Gordon Holtgrieve.

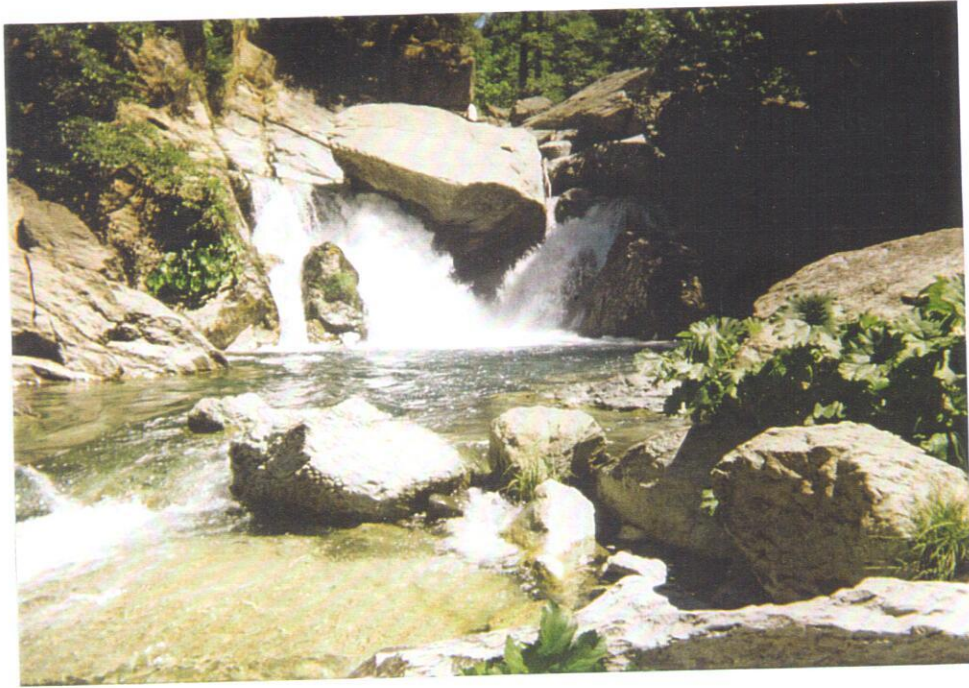
PHOTOGRAPHS



Waterfall at the end of Segment #1



Waterfall at the end of Segment #1 (Person at the base of the falls is 6'6" tall)



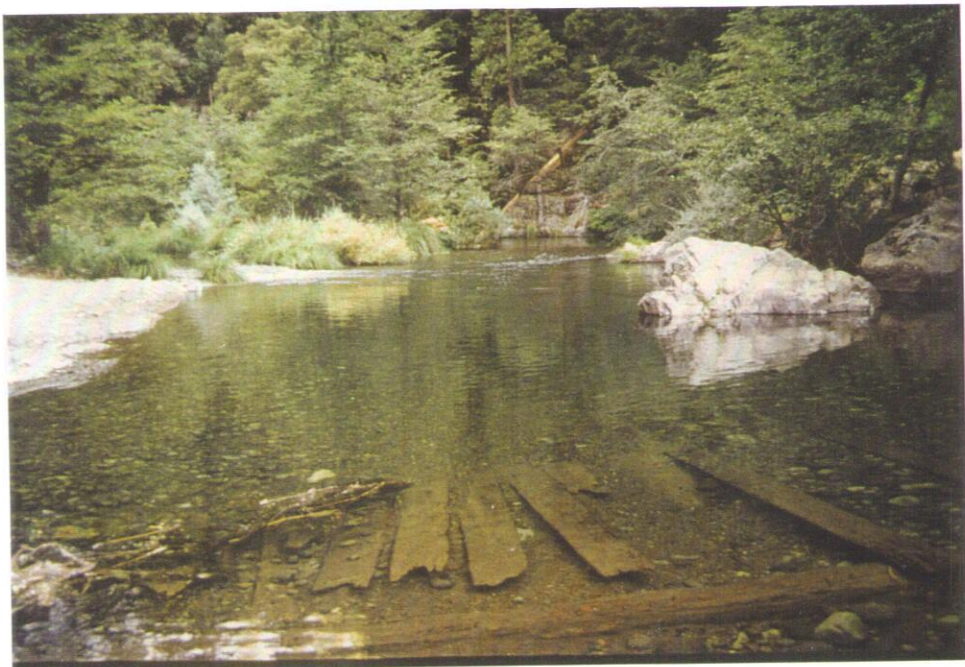
Twelve foot waterfall in Segment #2



Steep Sided Canyon in Segment #3



Butte Creek Head Dam



Gravel filled reservoir at Butte Creek Head Dam

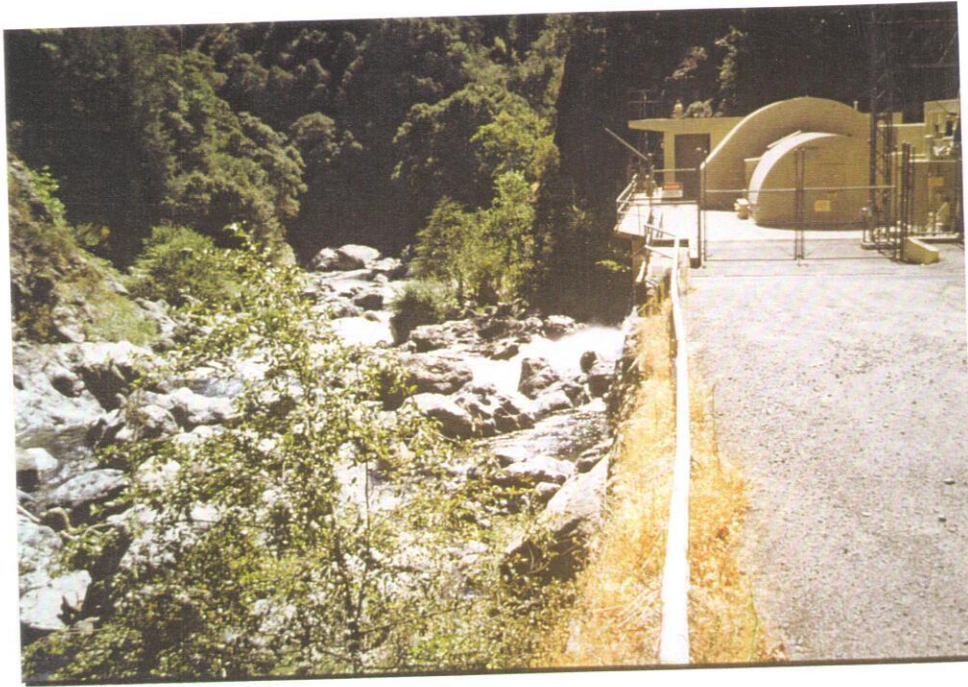


Six foot falls at Forks of the Butte Diversion Segment #6

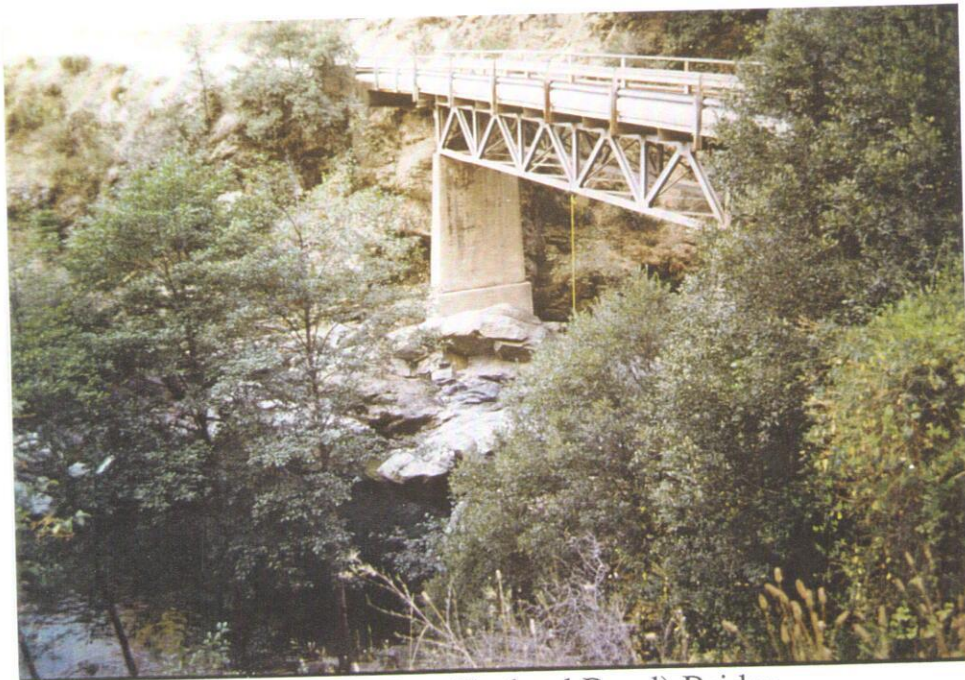


Part of Segment #6





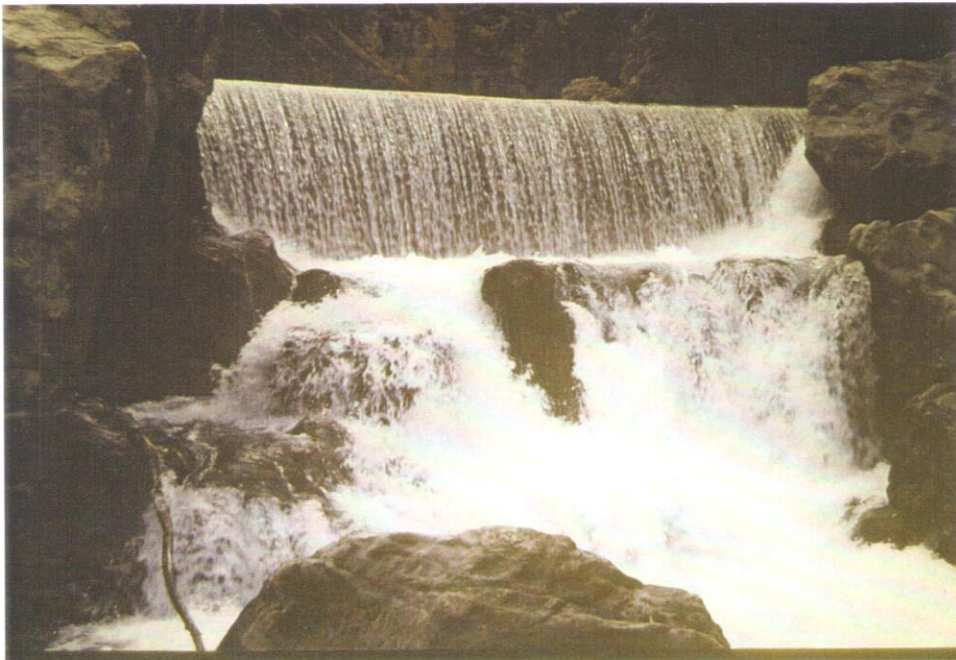
Forks of the Butte Powerhouse



Ponderosa Way (Garland Road) Bridge



Centerville Head Dam



Centerville Head Dam



Six foot waterfall downstream from Ponderosa Bridge



Waterfall downstream from Centerville Dam and upstream from Chimney Rock