PINE CREEK SYSTEM

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PINE CREEK SYSTEM

INTRODUCTION

Pine Creek originates in the southeastern Wallowa Mountains adjacent to Eagle Creek of the Powder River drainage, which borders it on the west (Figure 118). The stream enters the Snake River approximately 270 miles above the mouth and 25 miles below the mouth of the Powder River. The drainage area comprises more than 300 square miles. On the Snake River, immediately upstream from the mouth of Pine Creek, is the site of the Idaho Power Company Oxbow Dam, and 12 miles farther up the Snake River is Brownlee Dam, another power facility also belonging to the Idaho Power Company.

Topographically, the Pine Creek drainage is somewhat similar to Eagle Creek. From its point of origin, the stream flows successively through rugged mountains, forested plateau, and finally the hills bordering the Snake River. The climate varies with altitude and consists generally of cool temperatures and heavy precipitation in the mountains to warm summers and semi-arid conditions in the low lands.

The economic status of the Pine Creek region is contingent primarily on the agriculture and lumbering industries. Halfway, Oregon, located in Pine Valley in the central reaches of the basin, is the commercial and population center of the area. Irrigation, in conjunction with agricultural pursuits, is extensive in Pine Valley and water is withdrawn from main Pine, Clear, and East Pine Creeks. Formerly, the mining of heavy metals was important to the economy of the Pine Creek basin; however in recent years this industry has apparently diminished almost to a point of cessation.

Within the Pine Creek drainage, surveys were conducted on main Pine Creek and the major tributaries, East Pine, Clear, and North Pine Creeks. With the exception of Lake Fork, a tributary of North Pine Creek, observations were not conducted on the smaller streams of the drainage.

Anadromous salmonids known to exist in the Pine Creek system consist of steelhead trout and spring chinook salmon. From present indications, steelhead are the predominant species, the runs of salmon being depleted to the point of near extinction.

MAIN PINE CREEK

Introduction

Main Pine Creek is formed by the juncture of the Middle and West Forks approximately 2.5 miles above the former mining center of Cornucopia, Oregon. The two forks originate near an elevation of 7,200 feet. In the upper half of the drainage, Pine Creek flows in a southeasterly direction and in the lower half flows north by east to join the Snake River. The major tributaries are Clear, East Pine, and North Pine Creeks. Clear and East Pine Creeks enter the main stem in Pine Valley at approximately 14 and 13.5 miles, respectively, above the mouth. North Pine Creek joins Pine Creek about 7 miles above the mouth. Main Pine Creek is about 31 miles in length and joins the Snake River at an altitude of 1,650 feet. The stream is accessible to within a few miles of the headwaters via State Highway 86.

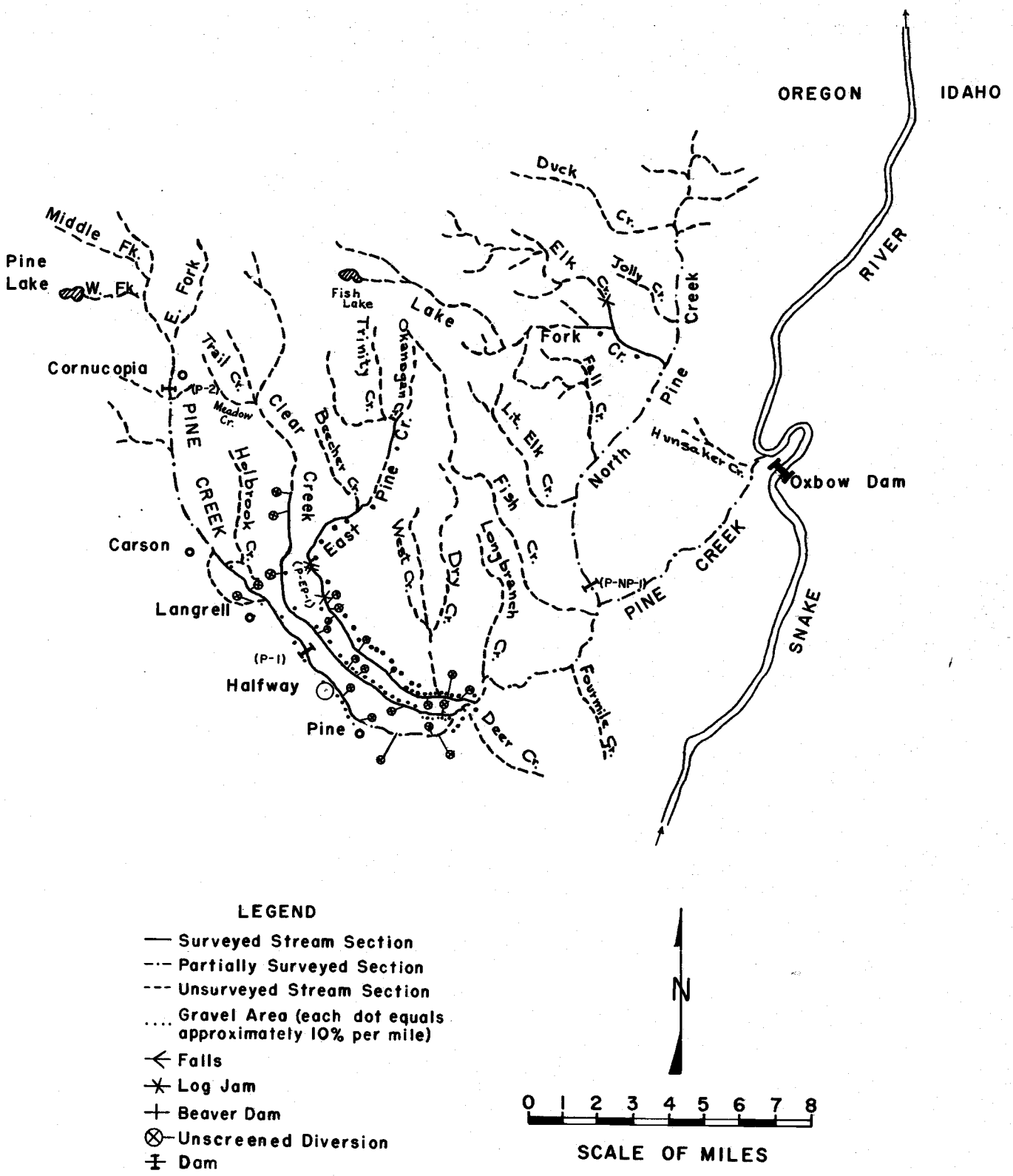

FIGURE 118. PINE CREEK SYSTEM

Inventory Surveys - Dates and Areas

Inventory surveys on main Pine Creek were conducted in April, June, August, and September 1959. Aerial, road, and foot surveys were used to observe the stream from Cornucopia to the mouth (30 miles). Table 92 lists the surveys conducted on Pine Creek.

Survey Data

Terrain and Gradient: From Cornucopia down to Carson, the Pine Creek canyon is intermediate between wide and narrow. Below Carson to the mouth of East Pine Creek, the stream is in the Pine Valley. Below Pine Valley the stream is again in a canyon which is moderate to moderately wide to the mouth.

The gradient in the upper areas above Pine Valley is steep with some steep to torrential sections. Halfway through the valley the gradient is moderate to steep and then is moderate to the end of the valley at East Pine Creek. From East Pine Creek to the mouth, the gradient is first moderate for a few miles, then moderate to steep, and the final few miles are steep.

Slope and Bank Cover: Slope cover in the area from Cornucopia to Carson is predominantly conifers and brush. Below Pine Valley, grass is the dominant cover type. Some rock outcroppings and conifers are also present.

Bank cover above Pine Valley is mostly conifers with some deciduous trees, grass, and brush intermixed. In the valley, deciduous trees and brush are the most common cover types, but much bank area is also covered with gravel and rubble from the streambed and some grass cover is present (Figure 119). Shoreline vegetation below Pine Valley is largely brush and deciduous trees.

Table 92. Location, Date, and Method of Observations on Main Pine Creek.

Location	Date	Method of Observation	Remarks
Cornucopia to Carson (5.5 mi.).	6-1-59	Aerial survey	
Cornucopia to 0.5 mi. above Carson (5 mi.).	9-11-59	Road survey	15% of stream observed.
0.5 mi. below Carson to East Pine Creek (10 mi.).	4-2-59	Foot survey	
East Pine Creek to mouth (13.5 mi.)	6-1-59	Aerial survey	
1 mi. below East Pine Creek to mouth (12.5 mi.).	8-18-59	Road survey	40% of stream observed.
Pine Valley	8-17-59	Foot survey	Investigate irrigation diversions.

Figure 119. Bank Cover Types on Pine Creek Near Halfway, Oregon. Photo Taken April 2, 1959.

Figure 120. An Unshaded Section of Pine Creek a Short Distance Above Halfway, Oregon. Photo Taken April 2, 1959.

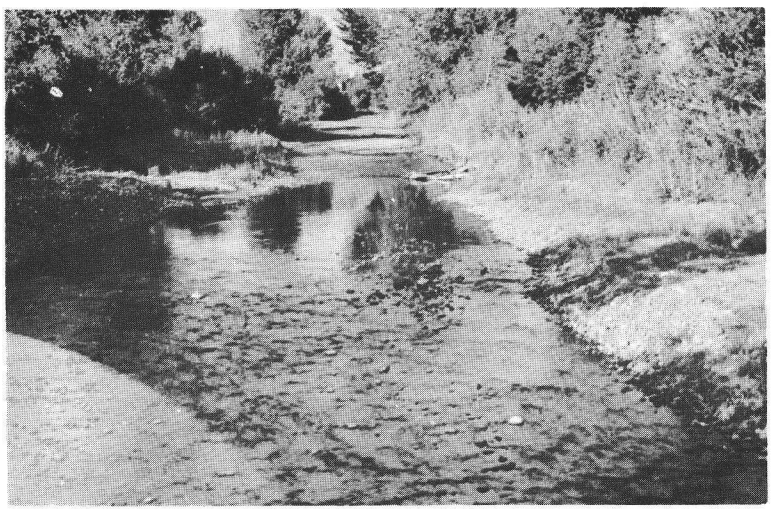

Figure 121. Pine Creek at Lower End of Pine Valley on August 18, 1959. Returning Water Recharged Stream.

Shade: Shade conditions above Pine Valley are considered good. From Cornucopia halfway down to Carson, the stream is partly shaded and the remainder of the distance to Carson is partly to densely shaded. In the valley, partial shading is the general condition but some open areas exist from shortly above Halfway down to the end of the valley at East Pine Creek (Figure 120). Below East Pine Creek stream shading is classified as partly shaded to open.

Stream Cross Section: This category was not evaluated from Cornucopia to Carson. From Carson to Halfway the stream has a shallow to moderate cross section. Below Halfway to Clear Creek, the cross section is moderate and then there is a short moderate-to-deep area down almost to East Pine Creek. From East Pine Creek down 2 miles, the stream changes to a moderate-to-shallow cross section and then is moderate for the remainder of the distance to the mouth.

Bottom Materials: An assessment of bottom materials was made over most of the 30 miles of stream from Cornucopia to the mouth of Pine Creek. A one mile section extending above and below Carson and one mile of stream immediately below East Pine Creek were not observed. Also, no assessment was made of a 2.5-mile area between Halfway and Clear Creek due to turbid water conditions at the time of the survey. All other areas were viewed either by means of a foot survey or from the road.

Of the entire section, the best gravel areas existed from shortly below the town of Halfway down to East Pine Creek. Table 93 presents the evaluations made from observations on Pine Creek.

Obstructions and Diversions: No definite obstructions were observed on Main Pine Creek when surveys were made in April. A low diversion dam (P-1) was observed one mile above Halfway on April 2, 1959, and another low dam (P-2) was seen near Cornucopia during an aerial survey on June 1, 1959. These may have been more serious obstructions at water stages other than those existing at the time of observation. In the summer, the stream is completely impassable in Pine Valley. Many diversion dams are obstructions and the streambed is dry in some places (P-3).

During a survey for diversions on Pine Creek on August 17, 1959, a total of 33 ditches was observed. Of these, 7 small ditches were not screened. An additional unscreened ditch was observed in April 1959. Table 94 lists the unscreened diversion ditches (P-4) located on Pine Creek.

Impoundment and Hatchery Sites: Abundant level area for off-channel impoundments exists along the stream in Pine Valley. Most of this land is presently used for agricultural purposes. A limited amount of off-channel impoundment area which is not agricultural land exists in the canyon above Carson. Impoundments in this region would be small, but summer temperatures should be more favorable than in the valley below.

No good hatchery sites were noted on Pine Creek. However, possible level areas in the canyon above Carson might be considered as favorable with respect to summer flows and temperatures, which are thought to be suitable for fish-cultural operations. As far as is known, a hatchery in this area would have to rely solely on the stream flow for its water supply.

Flow and Temperature Data: Flow and temperate data are very limited for Pine Creek. Flows and temperatures during the summer in Pine Valley are critical due to irrigation withdrawals. Summer temperatures below the valley are also believed to be high, but flows are increased by ground water returns (Figure 121) and tributary streams. Table 95 presents the available flow and temperature information on Pine Creek.

Table 93. Estimates of Streambed Composition in Pine Creek from Cornucopia to the Mouth as Determined by Observations in 1959.

Date and Stream Section	Streambed Composition	Remarks
9-11. Cornucopia to 0.5 mi. above Carson - 5 mi.	5% gravel - remainder rubble and boulders	Observations made from vehicle, 15% of stream observed.
4-2. 0.5 mi. below Carson to 3 mi. above Halfway - 3 mi.	10% gravel - 10% sand - 40% rubble - 40% boulders	Observations made by foot survey.
4-2. 2 mi. above Halfway to 1 mi. above Halfway - 1 mi.	20% gravel - 10% sand - 40% rubble - 30% boulders	Observations made by foot survey.
4-2. 1 mi. above Halfway to Brownlee-Halfway Road Bridge - 1.5 mi.	10% gravel - 10% silt and sand - 70% rubble - 10% boulders	Observations made by foot survey.
4-2. Brownlee-Halfway Road Bridge down 1 mi.	50% gravel - 50% rubble	Observations made by foot survey.
4-2. Next 2.5 mi. below Halfway	Not estimated	Poor visibility due to turbid water. Limited observations indicated gravel areas present.
4-2. Next 0.75 mi. - down to East Pine Creek	60% gravel - 20% rubble - 20% silt and sand	Observations made by foot survey, 50% of bottom not visible due to turbidity.
8-18. From 1 to 3.4 mi. below East Pine Creek - 2.4 mi.	40% gravel - 20% silt - 40% rubble	Observations made from vehicle, 40% of stream observed, gravel heavily silted in some areas.
8-18. Next 2.4 mi.	10% gravel - 10% silt - 60% rubble - 20% boulders	Observations made from vehicle, 20% of stream observed.
8-18. Next 2.4 mi.	10% gravel - 10% silt - 50% rubble - 30% boulders	Observations from vehicle, 10% of stream observed.
8-18. Next 4.8 mi.	50% rubble - 50% boulders	Observations made from vehicle, 60% of stream observed.
8-18. Last mi. to mouth	50% rubble - 50% boulders	Observations made from vehicle, most of stream observed.

Table 94. Unscreened Diversion Ditches (P-4) Located on Main Pine Creek During Surveys of April and August 1959.

Location	Est. Flow in c.f.s.	Remarks
On Tarter Slough - S.W. 1/4 Section 31, T 7 S, R 46 E.	Not recorded	Reported to have no way to by-pass fish back to stream; diverts to left. 1/
S.W. 1/4 Section 31, T 7 S, R 46 E.	2	Diverts to left.
N.W. 1/4 Section 16, T 8 S, R 46 E.	3	Diverts to left; reported to be used very little.
S.E. 1/4 Section 16, T 8 S, R 46 E.	1.5	Diverts to left.
N.E. 1/4 Section 22, T 8 S, R 46 E.	Not recorded	Diverts to left; observed during survey of 4-2-59.
N.W. 1/4 Section 24, T 8 S, R 46 E.	3	Diverts to left, located 200 yards above the first bridge above Clear Creek.

1/ Facing downstream.

Table 95. Spot Temperature and Flow Observations on Pine Creek.

Date	Location	Time	Temp. in °F. Air	Temp. in °F. Water	Est. Flow in c.f.s.
9-24-57	4 mi. below E. Pine Cr.	2:30 p.m.	---	65	25
4-1-59	At Pine	11:15 a.m.	55	45	---
4-2-59	1 mi. below Carson	10:20 a.m.	60	44	45
4-2-59	3 mi. below Carson	12:00 noon	60	48	50
4-2-59	1 mi. above E. Pine Cr.	3:00 p.m.	60	56	75
8-18-59	1 mi. above Clear Cr.	7:00 a.m.	---	---	10
8-18-59	Immediately above E. Pine Cr.	3:30 p.m.	---	77	20
8-19-59	Immediately above N. Pine Cr.	2:00 p.m.	---	65	45
9-11-59	4 mi. below Cornucopia	9:40 a.m.	75	50	30

Tributaries: The principal tributaries of Pine Creek are Clear, East Pine, and North Pine Creeks. These will be considered under separate sections of the Pine Creek system.

Other tributaries of the main stem of Pine Creek are the Middle, West, and East Forks, and Holbrook, Deer, Long Branch, Fourmile, and Fish Creeks (Figure 118).

None of these tributaries were surveyed and all are quite small with the exception of Fish Creek. This tributary is about 14 miles long and had an estimated flow of 2 or 3 c.f.s. at the mouth when observed on August 18, 1959. It is reported that water is diverted from the upper reaches of Fish Creek into Dry Creek, a tributary of East Pine Creek. The presence of this diversion was not confirmed.

With the exception of the East and West Forks, which drain areas of higher elevations, the other small tributaries are believed to be intermittent streams.

Anadromous Fish Populations

Two species of anadromous salmonids, chinook salmon and steelhead trout, are known to utilize Pine Creek.

Steelhead Trout: Catch records at fish screen by-pass traps located on irrigation ditches on Pine Creek indicate the existence of steelhead production in this stream (Table 96). Peak catches at the traps occur generally in the summer and fall months. No data have been obtained on the distribution or density of steelhead spawning on Pine Creek. Steelhead angling is popular on Pine Creek, and throughout much of the year the stream is open below the mouth of North Pine Creek to capture of this species.

Spring Chinook Salmon: Past records have indicated the destruction of former runs of spring chinook into Pine Creek. The use of a chemical pollutant, cyanide, by the mining industry was probably an important factor in this decline. However, in recent years, the capture of small numbers of downstream-migrant chinook at fish-screen, by-pass traps and the observation of spawning spring chinook have indicated that a remnant run exists.

Table 97 summarizes the catch records of juvenile chinook at fish-screen, by-pass trap installations on irrigation ditches diverting flow from Pine Creek for the years 1953-58. Spawning spring chinook and/or redds have been noted on Pine Creek about 2.5 miles below Cornucopia on 2 occasions - September 4, 1957, and September 9, 1959. During the earlier survey 2 redds were observed, and during the later survey 3 redds, 1 live chinook, and 1 dead spent female chinook were noted. Also on August 18, 1959, 2 live jack chinook were sighted in a pool on Pine Creek near Halfway.

There is a sport fishery for salmon in Pine Creek, but it is believed to be very limited. Estimated sport-catch figures for Pine Creek based on punch card returns are available in the Oregon State Game Commission Annual Reports of the Fishery Division. For the 5-year period 1954-58, the annual catches range from 13 to 55 fish with an average of 25. These figures are believed to be increased substantially by the mistaken identification of steelhead for salmon by the anglers. This conclusion is based primarily on the fact that the stream is closed to fishing before the run arrives.

Table 96. Monthly Catch Records of Rainbow-Steelhead Trout Captured in By-Pass Traps at Certain Irrigation-Ditch, Fish-Screen Installations on Pine Creek Above all Major Tributaries, 1953-58. 1/

Year	Period of Capture	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total
1953	5-8 to 10-31	--	0	2	12	6	113	49	52	234
1954	4-1 to 10-30	0	91	96	66	113	58	141	184	749
1955	5-24 to 10-23	--	--	10	46	105	91	115	187	554
1956	6-1 to 10-23	--	--	0	116	196	201	251	372	1,136
1957	5-24 to 10-23	--	--	5	52	84	31	42	255	469
1958	6-1 to 10-23	--	0	0	51	54	58	90	74	327
	Total	0	91	113	343	558	552	688	1,124	3,469

1/ Information furnished by the Oregon Game Commission.

Table 97. Monthly Catch Records of Juvenile Chinook Salmon Captured in By-Pass Traps at Certain Irrigation-Ditch, Fish-Screen Installations on Pine Creek Above all Major Tributaries, 1953-58. 1/

Year	Month of Capture		
	April	June	October
1953	0	0	5
1954	1	19	0
1955	--------No captures--------		
1956	0	0	1
1957	--------No captures--------		
1958	--------No captures--------		

1/ Data furnished by the Oregon Game Commission.

CLEAR CREEK

Introduction

Clear Creek arises near an altitude of 5,500 feet and flows approximately 18 miles to join Pine Creek at a point 14 miles above the mouth near the lower end of Pine Valley. Throughout the lower one-third of its length, Clear Creek flows entirely within Pine Valley. The stream course is in a southerly direction from the Wallowa Mountains, as is typical of all the principal streams in the Pine Creek system.

Since Clear Creek has no tributaries important to the propagation of salmon, surveys were conducted only on the main stem. Steelhead are the only fish of this type known to presently exist on the stream.

As influenced by an abundance of arable land adjacent to Clear Creek in the lower reaches, irrigation demands are excessive and typically result in a state of depleted flow during the agricultural season. This factor is important in limiting the potential of the stream for the production of spring chinook salmon. Clear Creek is accessible at frequent intervals in the lower 8.5 miles from county roads diverging from State Highway 86.

Inventory Surveys - Dates and Areas

The lower 12 miles of Clear Creek were observed during the present study. On June 1, 1959, the 12 mile distance from Meadow Creek to the mouth was observed by air and on August 17 and 18, 1959, a foot survey was made over the lower 9 miles of Clear Creek. A survey of irrigation diversions on Clear Creek was also made in August 1959.

Survey Data

Terrain and Gradient: From the upper limit of the survey at Meadow Creek down for about three miles, the stream is in a shallow canyon. Below here, the canyon widens rapidly into the broad Pine Valley. The stream gradient in the 12-mile section from Meadow Creek to the mouth is steep as far as the upper areas of Pine Valley (Figure 122). The lower 4 or 5 miles of the stream have a moderate gradient.

Slope and Bank Cover: The slope cover in the Clear Creek Canyon above Pine Valley is made up mostly of conifers with some brush and grass and a few deciduous trees intermixed. Streambank vegetation in the canyon area is principally conifers, brush, and grass. In the valley, brush, grass, and deciduous trees are the most prevalent cover types.

Shade: The stream is generally partly shaded over the upper 9 miles of the survey area and partly shaded to open on the remaining 3 miles to the mouth.

Stream Cross Section: The cross section of the stream was classified as moderate throughout the lower 9 miles of the stream, except for a half-mile-long shallow to moderate section about 2 miles above the mouth. The stream section extending from Meadow Creek downstream for 3 miles was observed only by means of an aerial survey and the stream cross section was not evaluated.

Bottom Materials: An assessment of bottom materials was made over the lower 9 miles of the stream. Gravel concentrations on Clear Creek are greatest near the mouth and diminish with upstream progression. The upper 3 miles contain little

Figure 122. A section of Clear Creek 8 Miles Above the Mouth. This Area Has a Rather Steep Gradient and Very Little Spawnable Gravel. Photo Taken August 17, 1959.

Figure 123. An Area of Low Flow on Clear Creek 1.5 Miles Above the Mouth. A Diversion Has Reduced the Flow to Under One-Half c.f.s. (8-18-59).

Figure 124. An Unshaded Section of East Pine Creek in Lower Pine Valley. Photo Taken April 1, 1959.

or no gravel. Table 98 presents, by section, the estimated proportion of the streambed containing gravel.

Obstructions and Diversions: Obstructions on the lower 12 miles of Clear Creek are believed limited to diversion dams and low flow areas. The aerial survey of the lower 12 miles of the stream on June 1, 1959, revealed no obstructions. Foot surveys during mid-August, 1959, indicated that there were 7 impassable diversion dams (P-C-1) in the Pine Valley section of Clear Creek. With the exception of 1 wooden dam, all were constructed of logs, gravel, and straw. They ranged in location from 1 to 8 miles above the mouth. The lower half of the survey area was also obstructed by low flows during mid-August.

Observations on August 17, 1959, indicated that 23 diversions existed on Clear Creek at that time. Of these, 10 were not screened, but one contained the concrete screen housing used in conjunction with rotary screens, and another has since been screened. The locations of the unscreened diversions (P-C-2) on Clear Creek are given in Table 99 and Figure 118.

Impoundment and Hatchery Sites: As with Pine Creek, possible off-channel impoundment sites are abundant in Pine Valley if excavation is considered. Smaller flat areas are also present in the lower region of the canyon above the valley.

Although very little is presently known about flow and temperature conditions on Clear Creek, there may be a possible hatchery site 8.5 miles above the mouth in Section 15 of Township 7 S, Range 46 E. This site has adequate level land, and summer temperatures and flows in this section of Clear Creek are believed suitable for supporting a hatchery facility. Winter conditions have not been evaluated.

Flow and Temperature Data: Flow and temperature data are scarce for Clear Creek. Limited observations indicate that flows during the irrigation season in the lower valley are very low and perhaps non-existent in some sections (Figure 123). Late summer flows above the valley are also much reduced and have been estimated at 15 c.f.s. in September. Summer temperatures are not believed to be excessive except in the areas of low flow in lower Pine Valley. Table 100 presents flow and temperature observations made on Clear Creek during this study.

Tributaries: The two main tributaries of Clear Creek are Meadow and Trail Creeks, both of which enter Clear Creek about 12 miles above the mouth. These are small streams, each being 2 to 3 miles in length, and neither was surveyed.

Anadromous Fish Populations

Based on catch records of fish-screen, by-pass traps and on general conditions of flow, it seems probable that steelhead trout are the only self-perpetuating anadromous salmonids present in Clear Creek. However, prior to interruption of the natural flow pattern by irrigation withdrawals, this stream may have supported runs of spring chinook salmon. Oregon Game Commission by-pass trap data for irrigation ditch fish screens on Clear Creek showed 2 juvenile chinook salmon captured in 1954. This is the only known record of salmon being present in Clear Creek in the recent past. Table 101 presents the numbers of fingerling rainbow-steelhead trout captured annually in fish-screen, by-pass traps. No information has been obtained concerning the distribution or density of steelhead spawning on this stream.

Table 98. Estimates of Gravel Concentrations on the Lower Nine Miles of Clear Creek as Determined by Observations in August 1959.

Area and Distance	Percentage of Streambed Composed of Gravel	Remarks
Upper 2 miles	No gravel	All rubble and boulders.
Next mile	5	Remainder of streambed composed of rubble.
Next mile	10	Remainder of streambed composed of rubble.
Next mile	20	Remainder of streambed composed of rubble.
Next 1.5 miles	40	Remainder of streambed composed mostly of rubble, but with some silt and sand.
Next 1.5 miles	40	Remainder of streambed composed mostly of rubble, but with some silt.
Last mile to mouth	90	Remainder of streambed composed of silt.

Table 99. Partial List of Unscreened Diversion Ditches on the Lower 9 Miles of Clear Creek, August 17, 1959.

Location	Est. Flow in c.f.s.	Remarks
At section line between sections 18 and 19, T 7 S, R 46 E.	4	On side channel of stream; diverts to right. 1/
S.E. 1/4 Section 19, T 7 S, R 46 E.	0.5	Diverts to right.
Just above section line between sections 30 and 31, T 7 S, R 46 E.	3	Diverts to right.
S.W. 1/4 Section 10, T 8 S, R 46 E.	2-3	Concrete screen housing present in ditch; diverts to left.
S.W. 1/4 Section 14, T 8 S, R 46 E.	3	Diverts to right; most of water returning to stream 0.25 mi. below at time of observation.
S.E. 1/4 Section 14, T 8 S, R 46 E.	3	Diverts to right; located 200 yds. below road bridge.
S.W. 1/4 Section 13, T 8 S, R 46 E.	0.5	Diverts to left; reported to be mainly a high water ditch.
East center of Section 5, T 8 S, R 46 E.	Dry	Diverts to left; mouth of ditch temporarily plugged; ditch 2 ft. wide and 2 ft. deep.

1/ Facing downstream.

Table 100. Spot Observations of Temperature and Flow on Clear Creek, 1957 and 1959.

Date	Location (In miles above mouth)	Time	Temp. in °F. Air	Temp. in °F. Water	Est. Flow in c.f.s.
9-4-57	8.5	3:20 p.m.	--	59	15
4-1-59	3	11:30 a.m.	--	45	25
8-17-59	8.5	2:20 p.m.	74	60	40
"	7.5	3:30 p.m.	75	62	25
"	7	1:30 p.m.	80	62	15
"	6	3:00 p.m.	78	67	15
"	5	4:00 p.m.	79	68	10
"	4.5	5:00 p.m.	74	68	8
"	4	5:30 p.m.	64	68	10
"	3	6:15 p.m.	68	64	3
8-18-59	3	5:35 a.m.	50	54	3
"	1.5	6:30 a.m.	57	57	3

Table 101. Monthly Catch Records of Rainbow-Steelhead Trout Captured in By-Pass Traps at Certain Irrigation-Ditch, Fish-Screen Installations on Clear Creek, 1954-58. 1/

Year	Period of Capture	June	July	Aug.	Sept.	Oct.	Total
1954	6-24 - 10-30	7	74	86	63	261	491
1955	7-24 - 10-30	--	21	141	129	954	1,245
1956	7-24 - 10-15	--	13	52	58	131	254
1957	7-1 - 9-7	--	152	99	19	--	270
1958	7-24 - 10-15	--	5	4	12	21	42
	Total	7	265	382	281	1,367	2,302

1/ Information from Oregon Game Commission.

EAST PINE CREEK

Introduction

East Pine Creek enters Pine Creek approximately 13.5 miles above the mouth and 0.5 mile below the mouth of Clear Creek. The stream is about 18 miles in length of which the lower 7 miles traverses Pine Valley. Elevation in the watershed ranges from nearly 7,500 feet in the Wallowa Mountains to slightly more than 2,400 feet at the stream mouth. The direction of flow is generally south.

The major tributary of East Pine Creek is Dry Creek. This stream was not surveyed nor were the smaller tributaries.

Data at hand indicate that the production of anadromous salmonids on East Pine Creek is currently limited to one species, steelhead trout. As on Clear Creek, flow depletion caused by irrigation is a principal restrictive factor reducing the potential of the stream for the propagation of spring chinook salmon.

Clear Creek is accessible at frequent intervals in the lower 15 miles by way of county roads originating from State Highway 86.

Inventory Surveys - Dates and Areas

Observations on East Pine Creek were made entirely by means of foot surveys over most of the lower 13 miles of the stream. In April 1959, 4 miles of the 5-mile canyon area below Trinity Creek were observed, and in August 1959, the lower 8 miles of stream, predominantly in Pine Valley, were surveyed. A 1-mile section extending from 0.5 to 1.5 miles above Beecher Creek was not observed. A survey of East Pine Creek diversions was also made in August 1959.

Survey Data

Terrain and Gradient: From the upper limit of observations shortly above Trinity Creek downstream for 0.5 mile, the terrain is sometimes gorge-like and a narrow canyon generally prevails. For the next 5.5 miles downstream to the start of Pine Valley, the canyon is somewhat wider. The remaining 7 miles of East Pine Creek below this section are all in the Pine Valley.

The gradient generally increases upstream; the lower 7 miles in Pine Valley have a moderate gradient; the next 5 miles in the canyon above Pine Valley have a gradient which is mainly moderate to steep; and a steep, or steep to torrential, gradient exists in the uppermost mile of the surveyed area. The USGS topographic quadrangle map for the stream section above the point of observation indicates that the gradient increases in steepness.

Slope and Bank Cover: Slope cover in the canyon area above Pine Valley is mostly conifers and grass. Bank cover in the lower 9 miles of the stream is a mixture of brush, deciduous trees, and grass. Above this section for 4 miles, to the end of the observed area, brush and some conifers are the principal bank-cover types.

Shade: Shade conditions on East Pine Creek varied considerably within the surveyed section. Shading was generally good with partly shaded and partly to densely shaded sections predominating. Open, or open to partly shaded, sections occurred from 0.75 to 1.5 miles and from 1.75 to 2.25 miles above the mouth (Figure 124).

Stream Cross Section: The stream cross section of the lower 13 miles of East Pine Creek was considered moderate throughout.

Bottom Materials: In the 6-mile canyon area above Pine Valley, all but a 1-mile section of the stream shortly above Beecher Creek was evaluated for bottom composition. In the lower 2 miles of the canyon area, 20 per cent of the streambed consisted of gravel, while the remaining observed stream course above that section contained an estimated 10 per cent gravel. In the entire area, boulders and rubble were the dominant streambed materials with rubble being increasingly prevalent with downstream progression in the canyon.

In the lower 7 miles of East Pine Creek, which are entirely in Pine Valley, gravel is more abundant than in the stream above. The greatest proportion of gravel in the streambed existed in the lower 3.5 miles of this section. Table 102 gives the apportionment of the streambed materials in the Pine Valley section of East Pine Creek.

Obstructions and Diversions: Obstructions in the observed section of East Pine Creek are in the form of debris jams, diversion dams, and low flow areas. All obstructions were observed in August when flows were low. Three debris jams (P-EP-1) located on the stream at the upper end of Pine Valley were considered to be possible obstructions at intermediate or high flow stages when steelhead would be migrating upstream. These are located 5.5 and 6.75 miles above the mouth and are recommended for removal. A total of 12 diversion dams (P-EP-2) obstructed the stream during the survey of August 18, 1959. Very few of these were of a permanent nature, most being constructed of gravel, hay, and debris, and all were believed passable at higher water stages. Flows in mid-August 1959 were extremely low, and fish passage in the stream was definitely blocked (P-EP-3) due to lack of water at points 1.5 and 2.5 miles above the mouth. Flow estimates at these locations were 1 c.f.s. or under.

A total of 23 diversion ditches was observed on East Pine Creek. Of these, 2 were considered abandoned, 1 was unscreened and dry, and 7 were unscreened and were taking water at the time of observation. The approximate locations of the 8 unscreened diversions (P-EP-4), which were observed in August 1959, are given in Table 103.

Observations of irrigation diversions were also made on Dry Creek, the main tributary of East Pine Creek. Nine diversions were observed and all were screened. Two diversions were located on the lower West Fork and 7 are on the main stream from 1 to 5.5 miles above the mouth.

Impoundment and Hatchery Sites: No natural impoundments were observed in the surveyed section of East Pine Creek. Flat areas in the canyon above Pine Valley could be used for excavating off-channel impoundments of small acreage, but no large impoundment sites (more than 10 acres) were observed. Farther downstream in Pine Valley, a large amount of level, off-channel, flat area exists. Some parts of this section, however, have very little summer flow due to irrigation withdrawals.

No favorable hatchery sites were found on East Pine Creek. No springs were located and it appears that the stream would be the only water supply for fish-cultural activities. Winter conditions would probably create the most serious problems associated with maintaining a successful hatchery, but no definite statements can be made because of a lack of flow and temperature information.

Table 102. Estimated Streambed Composition of East Pine Creek in the Pine Valley Area as Determined by Observations on August 18, 1959.

Stream Section in Miles Above the Mouth	Estimated Bottom Composition Expressed in Per Cent			
	Silt and Sand	Gravel	Rubble	Boulders
7 to 5.5	10	10	60	20
5.5 to 3.5	10	20	70	0
3.5 to 3	10	70	20	0
3 to 1.5	10	20	70	0
1.5 to 0.5	20	80	0	0
0.5 to 0	20	40	40	0

Table 103. Unscreened Diversion Ditches Located on the Lower 13 Miles of East Pine Creek During the Survey of August 18, 1959.

Location	Est. Flow in c.f.s.	Remarks
At section line between sections 32 and 33, T 7 S, R 46 E.	1	Diverts to the left. 1/
At section line between section 33, T 7 S, R 46 E, and Section 4, T 8 S, R 46 E.	Dry	Diverts to the left; reported to be used only during high water.
N W ¼ Section 4, T 8 S, R 46 E.	Not recorded	Diverts to the right; reported not to be screened because of low flow.
N W ¼ Section 10, T 8 S, R 46 E.	Not recorded	Diverts to the left; reported to be used very little.
N W ¼ Section 10, T 8 S, R 46 E.	2-3	Diverts to the right; reported to be used very little.
N E ¼ Section 14, T 8 S, R 46 E.	1	Diverts to right; reported to be mainly a highwater ditch.
North center of Section 13, T 8 S, R 46 E.	1-2	Diverts to right.
N E ¼ Section 13, T 8 S, R 46 E.	2-3	Diverts to left.

1/ Facing downstream.

Flow and Temperature Data: Flow and temperature data for East Pine Creek are available only for the dates of stream observation during the present study. No gaging or temperature station records are known to be available. Limited information indicates that irrigation withdrawals during the summer in Pine Valley reduce flows and raise temperatures to undesirable levels. Temperature and flow information for East Pine Creek is presented in Table 104.

Tributaries: The principal tributary of East Pine Creek is Dry Creek. This stream enters East Pine Creek about 1 mile above its mouth and is approximately 9 miles long. This stream was not surveyed except for observations of irrigation diversions which have been previously mentioned. On August 18, 1959, Dry Creek had a flow at the mouth which was estimated to be 4-5 c.f.s.

Other smaller tributaries are Beecher, Okanogan, and Trinity Creeks, located approximately 9, 12, and 13 miles above the mouth, respectively. These streams appeared to have steep gradients and are quite small. Each are about 2 or 3 miles long. In April 1959, Beecher Creek was flowing an estimated 5 c.f.s.; Okanogan Creek, 5-7 c.f.s.; and Trinity Creek, 3-4 c.f.s. Flow observations were made only at the mouths of these tributaries.

Anadromous Fish Populations

Catch records for by-pass traps operated at fish screen installations on certain ditches diverting water from East Pine Creek indicate that the stream sustains a run of steelhead trout (Table 105). Similar information for the tributary, Dry Creek, indicates that steelhead also inhabit this stream (Table 106). During the survey of East Pine Creek on April 1, 1959, 2 adult steelhead were observed in the vicinity of Beecher Creek.

The lack of fingerling chinook salmon in by-pass traps together with the existent flow pattern, which appears unfavorable to the production of chinook, suggest that this species may be non-existent in East Pine Creek.

Table 104. Spot Observations of Temperature and Flow on East Pine Creek, April and August, 1959.

Date	Location in Miles Above the Mouth	Time	Temp. in °F. Air	Temp. in °F. Water	Est. Flow in c.f.s.
4-1-59	13	3:45 p.m.	43	41	15
"	12	2:40 p.m.	54	43	15-20
"	8	--	--	--	35
"	2.5	11:45 a.m.	--	45	40
8-18-59	8	9:10 a.m.	66	56	25
"	7	10:30 a.m.	72	59	15
"	6	11:00 a.m.	74	65	10
"	5	11:05 a.m.	75	67	10
"	2.5	12:15 p.m.	77	72	5
"	2.5	2:25 p.m.	82	74	5
"	2.4	2:35 p.m.	--	--	1
"	1.5	2:30 p.m.	80	77	2
"	1.4	2:40 p.m.	--	--	1
"	Mouth	3:30 p.m.	78	72	10

Table 105. Monthly Catch Records of Fingerling Rainbow-Steelhead Trout Captured in By-Pass Traps at Certain Irrigation-Ditch, Fish-Screen Installations on East Pine Creek, 1954-58. 1/

Year	Period of Capture	Month of Capture							
		May	June	July	Aug.	Sept.	Oct.	Nov.	Total
1954	5-8 -- 10-15	14	371	163	125	1,040	541	---	2,254
1955	6-16 -- 10-30	---	22	696	101	276	920	---	2,015
1956	5-1 -- 10-23	74	112	165	237	152	1,320	---	2,060
1957	6-8 -- 10-	---	77	156	74	96	1,188	---	1,591
1958	6-1 -- 11-7	0	45	51	135	198	989	506	1,924
	Total	88	627	1,231	672	1,762	4,958	506	9,844

1/ Information furnished by Oregon Game Commission.

Table 106. Monthly Catch Records of Fingerling Rainbow-Steelhead Trout Captured in By-Pass Traps at Certain Irrigation-Ditch, Fish-Screen Installations on Dry Creek, 1955, 1957, and 1958. 1/

Year	Period of Capture	Month of Capture							
		Apr.	May	June	July	Aug.	Sept.	Oct.	Total
1955	8-8 -- 9-23	---	---	---	---	113	115	0	228
1957	6-8 -- 9-30	---	0	34	39	81	82	0	236
1958	6-1 -- 10-23	0	0	33	50	164	301	395	943
	Total	0	0	67	89	358	498	395	1,407

1/ Information furnished by Oregon Game Commission.

NORTH PINE CREEK

Introduction

North Pine Creek originates near the 5,200-foot level across the divide from the Imnaha River. The stream enters Pine Creek approximately 7 miles above the mouth near an altitude of 2,250 feet. North Pine Creek is 15 miles in length and flows due south throughout much of its course.

Agricultural use of the North Pine Creek Canyon is restricted by the topography to the lower few miles. In this regard, excessive irrigation demands are not existent as on the other major tributaries of Pine Creek. Watershed abuse is mainly in the form of extensive road construction along the stream bank. North Pine Creek is accessible in the lower 13 miles by way of a county road which intersects the Halfway-Copperfield Highway.

Inventory Surveys - Dates and Areas

On the North Pine Creek drainage, observations were made by means of aerial, road, and foot surveys. All observations were made in 1959 during the months of June, August, and September. The lower 13 miles of the main stem were observed from the air on June 1 and again from the road on August 18. On this latter survey, an estimated 50-60 per cent of the stream was observed. In September, a foot survey was conducted over the lower 3 miles of Lake Fork and over the lowermost 1 mile of its major tributary, Elk Creek. The numerous small tributaries and Duck Creek, a somewhat larger stream, were not surveyed.

Survey Data

Terrain and Gradient: North Pine Creek flows through mountainous terrain throughout its course. The stream canyon is relatively deep (Figure 125) and becomes narrower above Lake Fork in the 13-mile observed section from Duck Creek to the mouth. The gradient in this section was considered steep except for some moderate-to-steep areas in the lower 6 miles.

Slope and Bank Cover: Slope cover from Duck Creek to the mouth is composed of conifers and grass with some rock outcroppings. Conifers become less numerous with downstream progression. Bank vegetation above Lake Fork is a mixture of conifers, brush, and grass. Below Lake Fork, deciduous trees gradually replace the conifers. A road is adjacent to the stream over part of the lower 13 miles and certain areas have exposed soil and rubble rock banks (Figure 126).

Shade: Stream shade varies from moderate to open and, in general, shading is only fair.

Stream Cross Section: The cross section of the stream from Duck Creek to the mouth is moderate down to Lake Fork and moderate to shallow below.

Bottom Materials: An evaluation of bottom materials was made for the lower 13 miles of North Pine Creek by means of observations from a vehicle from which slightly more than half of the stream was estimated to have been observed. Conclusions from this survey were: (1) the lower 13 miles of North Pine Creek is relatively poor as a spawning area with less than 10 per cent of the streambed being composed of gravel; and (2) the best area is a 2-mile section located from 4.5 to 6.5 miles above the mouth. The streambed in this 2-mile section was estimated to contain 20 per cent gravel. Boulders were the dominant streambed component in all except the lower 2.5 miles which was comprised mainly of rubble.

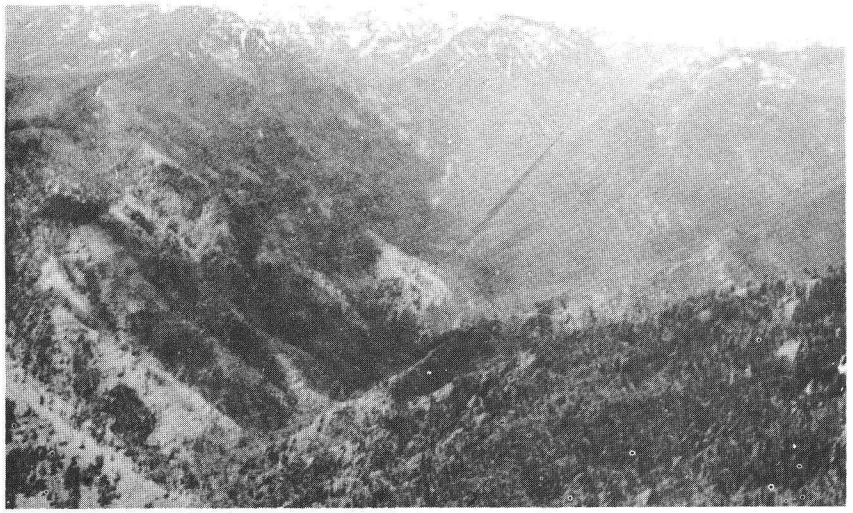

Figure 125. North Pine Creek Canyon a Few Miles Above the Mouth.

Figure 126. A Section of North Pine Creek 11 Miles Above the Mouth. A Road is Adjacent to the Stream.

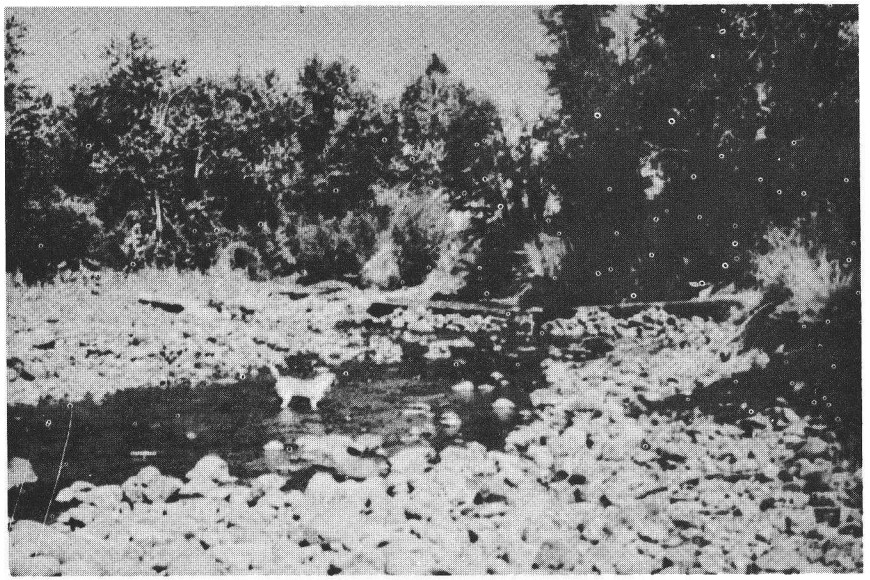

Figure 127. A Diversion Dam on North Pine Creek Located One-Half Mile Above the Mouth. This Dam Was Blocking Upstream Migration on September 11, 1959.

Figure 128. One of Several Possible Impoundment Areas of Small Acreage Located Between the Canyon Wall and a Roadbed on North Pine Creek.

Obstructions and Diversions: No obstructions were noted on the aerial survey of June 1, 1959, but in late summer a diversion dam (P-NP-1) (Figure 127) located 0.5 mile above the mouth blocked the stream. No other obstructions were noted on North Pine Creek.

One diversion was observed 0.5 mile above the mouth on September 11, 1959. This was screened at the time of observation, but the screen by-pass flow was used for irrigation and no water was returning to the stream. A few small salmonids were seen in this by-pass channel. No other diversions are believed to exist on North Pine Creek in the area of anadromous salmonid use.

Impoundment and Hatchery Sites: Possible impoundment areas exist on North Pine Creek. The most promising areas are small depressions created by the canyon wall and the roadbed which runs along the stream (Figure 128). Nine such locations were noted in the section from 3.5 miles above the mouth upstream for 7.5 miles to Trap Creek. These sites were small and ranged in size from approximately 1 to 6 acres. It is estimated that possibly 25 acres of pond area could be developed from these small depressions. No hatchery sites were noted on North Pine Creek.

Flow and Temperature Data: Flow and temperature observations on North Pine Creek are restricted to observations in August and September 1959. These observations are as follows: (1) 8-19-59 -- near Duck Creek at 10:50 a.m., air 52°F., water 54°F., flow 6 c.f.s.; (2) 8-19-59 -- 1 mile below Elk Creek at 12:50 p.m., air 57°F., water 59°F.; (3) 8-19-59 -- at mouth at 2:00 p.m., air 64°F., water 63°F., flow 25 c.f.s.; and (4) 9-11-59 -- 0.5 mile above mouth at 11:00 a.m., water 66°F., flow 18 c.f.s. It should be noted that August 19 was a relatively cool day.

Tributaries: North Pine Creek has many very small tributaries and a few of intermediate size or larger. The more important North Pine tributaries are: Duck Creek, which is approximately 6.5 miles in length; Lake Fork, 12 miles long; Elk Creek, a tributary of Lake Fork, 7.5 miles long; Fall Creek, 4 miles in length; and Little Elk Creek, the lowermost tributary, which has a length of about 5.5 miles. Stream surveys were conducted on Lake Fork and Elk Creeks. The other tributaries mentioned above were observed at their mouths on August 19, 1959. Flows at that time were: Duck Creek, 6 c.f.s.; Fall Creek, 1 c.f.s.; and Little Elk Creek, 2 c.f.s.

Lake Fork and Elk Creek were surveyed on September 11, 1959. Lake Fork was observed over its lower 3 miles and was found to be marginal for spawning. The gradient was generally steep with some steep to torrential sections above the mouth of Elk Creek. Less than 10 per cent of the streambed was estimated to be suitable for spawning. On Elk Creek, only the lower mile was investigated. This section had a very steep gradient and practically no spawning area.

Low flow obstructions were present on these two streams. A small falls on Lake Fork about 3 miles above the mouth was believed to be a low-flow barrier and a debris jam about 0.75 mile above the mouth on Elk Creek was also blocking the stream at low water stages.

Flow and temperature data for Lake Fork and Elk Creek in 1959 were as follows: (1) Lake Fork at the mouth at 12:00 noon, water 57°F., flow 12 c.f.s. on August 19; (2) Lake Fork at the mouth at 12:00 noon, air 85°F., water 59°F., flow 10 c.f.s. on September 11; (3) Lake Fork 1 mile above the mouth at 1:10 p.m., air 79°F., water 58°F., flow 10 c.f.s. on September 11; (4) Lake Fork just above mouth of

Elk Creek at 2:10 p.m., water 57°F., flow 4 c.f.s. on September 11; (5) Elk Creek at mouth at 2:10 p.m., water 56°F., flow 6 c.f.s. on September 11; and (6) Elk Creek 1 mile above the mouth at 3:10 p.m., water 55°F., flow 6 c.f.s. on September 11.

Anadromous Fish Populations

Spring Chinook Salmon: Although North Pine Creek has not previously been reported to support a run of spring chinook, a few fish of this type were noted during the survey of the main stream and its tributary, Lake Fork. One observation consisted of a dead female chinook found on North Pine Creek on August 19, 1959, about 1 mile below the mouth of Lake Fork. On a later survey made September 11, 1959, on Lake Fork, 2 dead female chinook and one redd were noted in the lower 1.5 miles of the stream.

Steelhead Trout: North Pine Creek is reported to have a run of steelhead. This is substantiated by the presence of stream conditions consistent with the production of this species. During the surveys of North Pine Creek and Lake Fork, juvenile trout were noted on both streams.

DISCUSSION AND RECOMMENDATIONS

Fish Transplants

No recommendations are made concerning fish transplants of steelhead or spring chinook in the Pine Creek system. Steelhead remain established in the drainage despite large irrigation withdrawals in Pine Valley. Spring chinook appear to be near extinction, and it is doubtful if transplants would be of value under the present environmental conditions. North Pine Creek might possibly support more spring chinook, but late summer flows are low and it is suspected that summer temperatures would be unfavorably high.

A more promising consideration for transplant efforts might be through the use of silver salmon or fall chinook stocks. With the information at hand, the introduction of fall-spawning fish into Pine Creek appears as a reasonable possibility. From the standpoint of spawning gravel and flow, the best area for such transplants is a 7-mile section extending upstream from 3 miles above North Pine Creek to 3 miles above Clear Creek. The lower half of this section, below the exit of the valley near the mouth of East Pine Creek, should have suitable flows since it is below 2 major tributaries.

Flows in the lower valley below Clear Creek were considered adequate for limited salmon spawning in August 1959, and could be expected to be increased by October when irrigation is curtailed and fall precipitation has commenced. Because of limited observations, it is difficult to predict just how much of the Pine Creek channel above Clear Creek would have suitable flows for fall salmon spawning. On August 18, 1959, a flow estimate of 10 c.f.s. was made for the stream about 1 mile above Clear Creek. At that time the stream channel was not usable for spawning in many places. However, some areas of constricted flow did offer spawning sites, and, with more favorable conditions in the fall of the year, much of the streambed in the lower valley should offer suitable spawning area. With adequate flows, good spawning conditions would exist up to the vicinity of the settlement of Pine. Water temperatures should have cooled sufficiently by October since the mean air temperature for that month in Pine Valley is 48°F.

A considerable amount of gravel is present in the streambed of the lower 4 or 5 miles of the Pine Valley area and spot checks below the valley have revealed

good gravel sections in a 2-mile area located a few miles above North Pine Creek. Some silt is present in the streambed but there are indications that ground water flows are good. Test plants of eyed eggs should be used for a more definite determination of the incubational qualities of this section of Pine Creek.

It is not known whether fall chinook would be more preferable than silver salmon as a species for transplantation. Many environmental factors, regarding which no comment can be made, would influence this decision. However, on the basis of a probable short freshwater rearing period, which would avoid the unfavorable summer-time conditions in Pine Valley, it is believed that transplants of fall chinook would be more likely to meet with success.

Obstructions and Diversions

Obstructions on the Pine Creek system may be divided into 2 groups, those existing prior to the irrigation season, and those existing during the irrigation season.

Prior to the irrigation season, no complete barriers are known to exist in the observed sections of the Pine Creek drainage. Two debris jams (P-EP-1) located on East Pine Creek 6.75 miles above its mouth and one other jam (P-EP-1) located 5.5 miles up the same stream appeared to be possible or potential migration barriers during intermediate flow stages and should be removed. Certain permanent diversion dams may also obstruct fish passage at lower flow stages prior to the irrigation season, but none are known to be serious barriers. These obstructions are listed in Appendix B.

Surveys during the irrigation season in August 1959 revealed a total of 19 temporary and permanent diversion dams in Pine Valley which were considered impassable. Impassable areas also existed due to low flows. On North Pine Creek, flow conditions were somewhat better because of less irrigation. Only one diversion dam (P-NP-1) was observed on North Pine Creek. This was located approximately 0.5 mile above the mouth and was blocking upstream migration in the late summer.

It is not known what effect the diversion dams have upon upstream migration of the present anadromous runs. Steelhead are probably affected little by these obstructions since they are migrating when flows are relatively high and only a few permanent dams of low height are in the stream. Because of irrigation withdrawals, the timing of the surviving Pine Creek chinook run has probably been largely modified to an early migration pattern so that the fish are migrating while the spring runoff is still in progress.

No recommendations are made concerning fish passage at diversion dams at this time, but it is recommended that the 3 debris obstructions (P-EP-1) located on East Pine Creek be removed.

Numerous small diversions were found to be unscreened in the Pine Creek system. The effect of the individual diversions on the reduction of downstream migrant salmonids eventually leaving the Pine Creek system has not been ascertained. Some diversions are undoubtedly less serious than others and, from a practical standpoint, possibly should not be screened. In the aggregate, however, the unscreened ditches in the Pine Creek drainage are believed to result in a substantial loss of downstream migrants. Since no evaluation of fish loss was possible during the present study, it is recommended that all unscreened diversions which were located during field observations be further investigated on an individual basis to determine the probability and degree of fish loss. If this procedure cannot be carried out under the scope of the program, other more easily determined criteria

such as size of ditch, or period of diversion, may be needed to determine the extent of needed screening. If it is assumed that all unscreened ditches take fish, then the screening of 22 diversions on main Pine, Clear, and East Pine Creeks would be in order. On North Pine Creek, no screening is needed, but the one diversion observed on that stream needs a better by-pass system so that fish will not be by-passed into the adjacent fields.

It is important that the Pine Creek system be utilized to its fullest productive capacity. The urgency is brought about by the actual construction of several, and the anticipated construction of more, dams on the Snake River which may seriously threaten the salmon and steelhead which utilize spawning grounds upstream from Pine Creek.

Pine Creek is one of several Snake River tributaries in Eastern Oregon which should have its former runs of spring chinook restored. However, the Snake River fall runs of salmon must be considered at this time while parent stocks of fish are still available for experimentation and study.

It is recommended that an experimental transplant of fall chinook from the upper Snake River stock be conducted in Pine Creek. Several hundred adult fall chinook from the latest part of the run at Oxbow Dam should be trapped and hauled to Pine Creek. The Idaho Power Company operates a trapping and hauling system at Oxbow Dam and it would be a simple matter to haul the fish the short distance to Pine Creek rather than to the reservoir above Brownlee Dam. It may be necessary to install a weir to keep the fish from going back down stream and a biologist should be present during spawning and rearing to observe the success of the operation. This program should continue over a four- or five-year period and the returning adults should be enumerated to determine the success of the transplant. There is reason to suspect that the late arrivals at Oxbow Dam may not spawn successfully in the Snake River since they still have a long distance to traverse before reaching the spawning grounds. Another factor is the possibility of a dam at Guffey, Idaho, which will flood out much of the present spawning area. These transplantation efforts would be contingent on an adequate flow of water during the fall, winter, and spring months. Since this coincides with the least need for irrigation water, prospects should be reasonably good that water could be obtained for this purpose. The introduction of eyed fall chinook eggs into the gravel of Pine Creek might also be considered. This would involve a holding pond and egg incubation station.

Current proposals by the Idaho Power Company under consideration before the Federal Power Commission deal with the prospects of transferring the entire Pine Creek run to Catherine Creek of the Grande Ronde river system. At the time of writing no agreement has been reached.

Impoundment and Hatchery Sites

A considerable amount of level area for the excavation of off-channel impoundments exists in Pine Valley, and a limited area is present in the canyons above the valley. The only impoundment sites which would require relatively little excavation were observed on North Pine Creek. These were formed from the enclosing of small areas by a road bed and the canyon wall. Up to 25 acres of impoundment area could be obtained by developing these 1- to 6-acre sites.

No outstanding hatchery sites were observed in the Pine Creek drainage. Locations which might have some possibility for development were noted in the main Pine, Clear, and East Pine Creek canyons shortly above Pine Valley.

Stream Improvements

No recommendations for stream improvements are made other than for supplemental water for fish life. This would require a decrease in present irrigation demands or the use of headwater reservoirs. It is recommended that a detailed study of actual water-use and water-right allocation be undertaken to determine if additional water could be made available for fish-life. In order to specify certain quantities of water for the exclusive use of fish, new precedents would need to be established with users and the Bureau of Reclamation, Irrigation Districts, etc.