Upper Rogue Watershed Assessment

Chapter 4 Fish Populations and Habitat

Upper Rogue Watershed Association

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4 FISH POPULATIONS AND HABITAT

4.1 Introduction

This chapter summarizes information about fish populations and habitat in the Upper Rogue Watershed. It examines native salmon and trout populations through time, aquatic habitat quality, and the natural factors and management practices that influence fish movement through streams. The discussion includes an evaluation of the major influences on key fish populations in the Upper Rogue Watershed, with an emphasis on the watersheds draining the area below Lost Creek Dam.

Water flow patterns, stream habitat, and fish populations change through the seasons and over time in response to natural and human events. Natural events such as floods and droughts help shape stream habitat and affect fish distributions and populations. Human actions, such as construction of roads, diversion of water, and application of land use practices, can modify aquatic and riparian habitat, change fish passage through rivers and tributary streams, and affect fish populations.

The Upper Rogue Watershed's anadromous salmon and trout populations – spring and fall Chinook salmon and winter and summer Steelhead trout – are considered part of the larger Rogue River Basin's population. The Oregon Department of Fish and Wildlife (ODFW) manages most of the data collection for salmon, steelhead, resident trout and other fish, and is responsible for fish population management throughout the Rogue River Basin.

Information on the Upper Rogue Watershed's aquatic habitat, fish populations, and fish passage barriers was derived from studies, inventories, and other documents produced by the ODFW and other sources. Stream habitat inventory reports completed by ODFW in the 1990s provide detailed habitat information for selected tributary streams draining into the Upper Rogue River below Lost Creek Dam.

4.2 Fish Species Distribution and Population Trends

A variety of native fish species live in the river and stream habitats of the Upper Rogue Watershed. Eight salmonid species (family *Salmonidae*) inhabit the watershed during at least a portion of their life cycles: Coho salmon, spring Chinook salmon, fall Chinook salmon, winter steelhead, summer steelhead, cutthroat trout, rainbow trout, and mountain whitefish. Coho salmon, Chinook salmon and steelhead trout are all anadromous species: fish that spawn in fresh water and spend a portion of their life cycle in the Pacific Ocean. The non-salmonid anadromous species present in the watershed is Pacific lamprey (*Lampetra tridentata*). Other native resident fish species present in the watershed include western brook lamprey (*Lampetra richardsoni*), Klamath smallscale sucker (*Catostomus rimiculus*), speckled dace (*Rhinichthys osculus*), three-spine stickleback (*Gasterosteus aculeatus*), reticulate sculpin (*Cottus perplexus*), ripple sculpin (*Cottus gulosus*), and Coast Range sculpin (*Cottus aleuticus*). This chapter focuses on the status of the watershed's salmonid species and Pacific lamprey.

4.2.1 Distributions

The Fish Distribution map (Map 7) displays the stream use areas for resident and anadromous salmonids in the Upper Rogue Watershed. While fish distribution and fish use patterns within accessible habitat usually vary annually, this map depicts the known upper extent of fish distribution. The distribution of anadromous and resident fish varies by watershed (Table 4-1). Resident trout are the only salmonids present above Lost Creek Dam. Historically, cascades on the Rogue River and other natural barriers blocked access to the upper watershed for migratory fish species and restricted most of the river and stream habitat to resident fish. The construction of Lost Creek Dam was halted in 1987, blocking access to the limited habitat in the upper watershed that was historically accessible to migratory fish, primarily affecting spring Chinook salmon (ODFW 2005a). Because spring Chinook salmon spawn in the channel of the Upper Rogue River, the dam disproportionately impacted this species, eliminating approximately 9 miles (21% of the historic habitat) of historic spring Chinook spawning habitat. The dam also eliminated 12 miles (4% of the historic habitat) of Coho and 25 miles (4% of the historic habitat) of winter/summer steelhead habitat.

Table 4-1. Resident and Anadromous Fish Distribution for the Subwatersheds Comprising the Upper Rogue Watershed

Fish Species	Fish Species Distribution by Subwatershed (Miles of Stream)							
	Shady Cove	Lost Creek	Trail Creek	Elk Creek	Big Butte Creek	South Fork Rogue River	Upper Rogue River	Upper Rogue Totals
Coho	29.5	1.7	14.4	37.2	31.0	0.0	0.0	113.8
Spring Chinook	21.4	0.0	0.0	9.2	14.3	0.0	0.0	44.9
Fall Chinook	20.4	0.0	0.0	9.2	0.0	0.0	0.0	29.6
Winter steelhead	20.4	0.0	13.8	38.8	52.4	0.0	0.0	125.4
Summer steelhead	48.1	0.0	24.1	55.6	60.7	0.0	0.0	188.5
Resident trout	56.9	25.3	28.5	96.9	162.8	126.3	315.8	812.5
Total fish bearing	56.9	25.3	28.5	96.9	162.8	126.3	315.8	1314.7
Total stream miles	329.1	128.0	199.0	510.7	483.9	438.0	1,040.4	3,129.1
Percent fish bearing	17.3%	19.8%	14.3%	19.0%	33.6%	28.3%	30.4%	

NOTE: The extent of fish distribution is based on GIS analysis of ODFW data (refer to Map 7, Fish Distribution).

Because resident trout can reside in higher gradient headwater streams and above barriers to migration, rainbow and cutthroat trout occupy the largest proportion of stream miles, as shown in Table 4-1. Steep headwater streams (usually greater than 12% gradient) that are not accessible to fish comprise the largest proportion of stream miles in all of the subwatersheds. The percent of fish-bearing stream miles ranges from 14.3% in the Trail Creek subwatershed, to 33.6% in the Big Butte subwatershed. The extent of resident fish distribution is probably underestimated for all of the watersheds, particularly for streams above Lost Creek Dam.

Resident and anadromous fish reside for at least a portion of their life cycle in all of the Upper Rogue River subwatersheds below Lost Creek Dam. Because adult summer steelhead trout will access small streams for spawning, these fish have the most extensive distribution of the anadromous fish. Big Butte Creek subwatershed has the greatest extent of fish-bearing streams (162.8 miles) and the most habitat accessible to summer steelhead trout (60.7 miles). Elk Creek subwatershed has the largest extent of habitat accessible to Coho salmon (37.2 miles). The following sections provide more detail on the fish distribution for each of the subwatersheds.

4.3 Fish Population Trends

The ODFW recently completed the Oregon Native Fish Status Report (ODFW 2005a). This report describes the current population status and trends for native fish based on a consistent set of criteria. The criteria for whether a population of fish is sustainable or not provides guidance for managing the factors that limit the productivity of populations: harvest, hatcheries, habitat, and dam management. The assessment focuses on groups of populations from a common geographic area with similar life history (spawning timing and other traits) and genetic traits. This section describes the population criteria for the Rogue River Basin populations with an emphasis on the Upper Rogue.

The criteria used to evaluate fish population status include the following:

Existing populations: Criteria – At least 80% of historical populations are still in existence (i.e., not extinct) and not at risk of extinction in the near future.

Habitat use distribution: Criteria – Naturally produced members of a population occupy at least 50% of the historically used habitat in at least three of the last five years for at least 80% of existing populations.

Abundance: Criteria – The number of naturally produced fish is greater than 25% of average levels in at least three of the last five years for at least 80% of existing populations.

Productivity: Criteria – The population replacement rate for at least 80% of the existing populations is at least 1.2 naturally produced adult offspring per parent in three of the last five years when total abundance was less than average returns of naturally produced fish.

Reproductive independence: Criteria – 90% or more of the spawners are naturally produced in at least three of the last five years for at least 80% of existing populations.

One final criterion – hybridization – is typically not an issue for the Upper Rogue's anadromous fish populations. Hybridization involves interbreeding between related species (cutthroat trout vs. rainbow trout or bull trout and brook trout).

Table 4-2 outlines the status of Upper Rogue River anadromous fish populations based on the ODFW's assessment criteria. The Rogue River Basin's anadromous fish populations are among the healthiest in the state (ODFW 2005a). With the exception of spring Chinook salmon, all of the populations receive passing "grades." Due to large numbers of hatchery fish in the basin, the Chinook salmon population failed the reproductive independence criterion.

Table 4-2. The Status of Upper Rogue Anadromous Fish Populations based on ODFW's Native Fish Assessment Criteria

Species	Listed?	Existing	Distribution	Abundance	Productivity	Reproductive Independence
Coho	Threatened	Pass	Pass	Pass	Pass	Pass
Spring Chinook	No	Pass	Pass	Pass	Pass	Fail
Fall Chinook	No	Pass	Pass	Pass	Pass	Pass
Winter Steelhead	No	Pass	Pass	Pass	Pass	Pass
Summer Steelhead	No	Pass	Pass	Pass	Pass	Pass

NOTE: The listed status indicates whether the population is listed as threatened or endangered under the federal Endangered Species Act (ESA). Only the Upper Rogue Coho population is listed as threatened.
Source: ODFW 2005a.

The following sections describe the population status for the Upper Rogue River salmon, steelhead, cutthroat trout, and lamprey populations. Counts of returning adult fish at Gold Ray Dam on the mainstem Rogue River provide the best quantitative estimates of steelhead and salmon population abundance and trends.

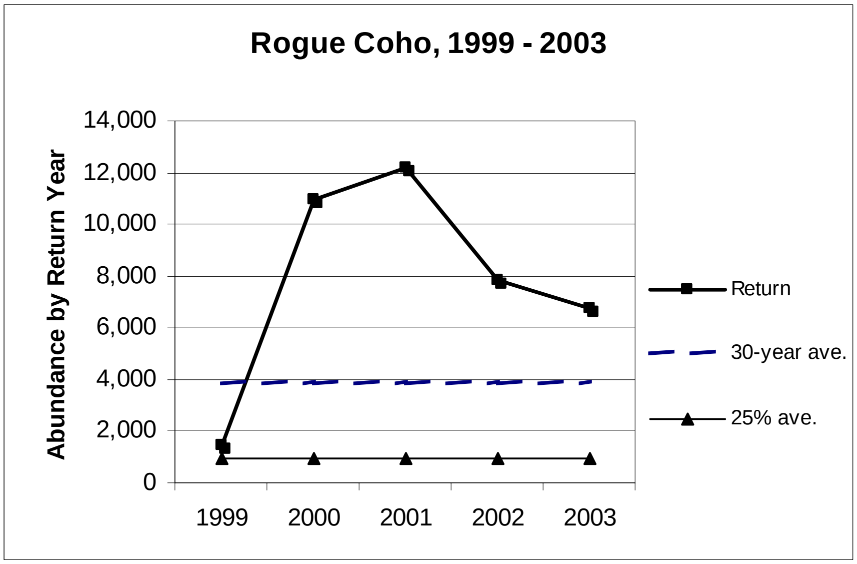
4.3.1 Upper Rogue Coho Salmon

The Rogue River Coho salmon population consists of the Upper Rogue population and two other populations (Middle Rogue and Illinois). Coho salmon adults pass Gold Ray Dam between late September and January with peak passage occurring from mid-October through the end of November (Bureau of Reclamation 2005). In the Upper Rogue Watershed, Coho salmon spawn in most of the large and medium-sized tributaries (refer to Map 7). Juveniles normally spend one summer and one winter in fresh water. They migrate to the ocean in the spring, generally one year after emergence, as silvery smolts about four to five inches long.

The Upper Rogue population (upstream of the Applegate River) meets all six of the ODFW's criteria indicating that near-term sustainability is not at risk. Most of the historical Coho habitat in the Upper Rogue remains accessible. The partially completed Elk Creek Dam on lower Elk Creek blocks access to the habitat, but a trap-and-haul operation at the base of the dam moves fish (Coho and Steelhead) above the dam (refer to Section 4.10.2 for a discussion of the dam). The abundance criterion was exceeded in four of the five years of record (Figure 4-1).

Wild returns to the Rogue River in the last 4 years are among the greatest in the 20 years of population estimates. The Upper Rogue wild Coho appear to be reproductively independent from hatchery fish. Between 1999 and 2000, the percent of hatchery fish among wild Coho spawners ranged between 0% and 3%. The ODFW determined that the threshold number of Coho salmon need to sustain the naturally produced population is greater than 25% (500 fish) of the 30-year average levels (4,000 fish) in at least three of the last five years of record (1999-2003).

Figure 4-1. Counts of Wild Upper Rogue Coho Salmon at Gold Ray Dam, 1999-2003



NOTE: Recent returns are compared to the 30-year average return and the 25% average return level criteria for abundance.
Source: ODFW 2005a.

A combination of factors, including rearing and spawning habitat loss, reduction in summer streamflow, passage impacts at culverts and other obstructions, a decrease in productivity of ocean habitat, and impacts caused by hatchery programs, contribute to the decline of the Rogue River Coho populations. Coho salmon evolved in freshwater ecosystems historically characterized by a high degree of structural complexity including large wood in streams, deep pools, flood plains, braided channels, and cool water.

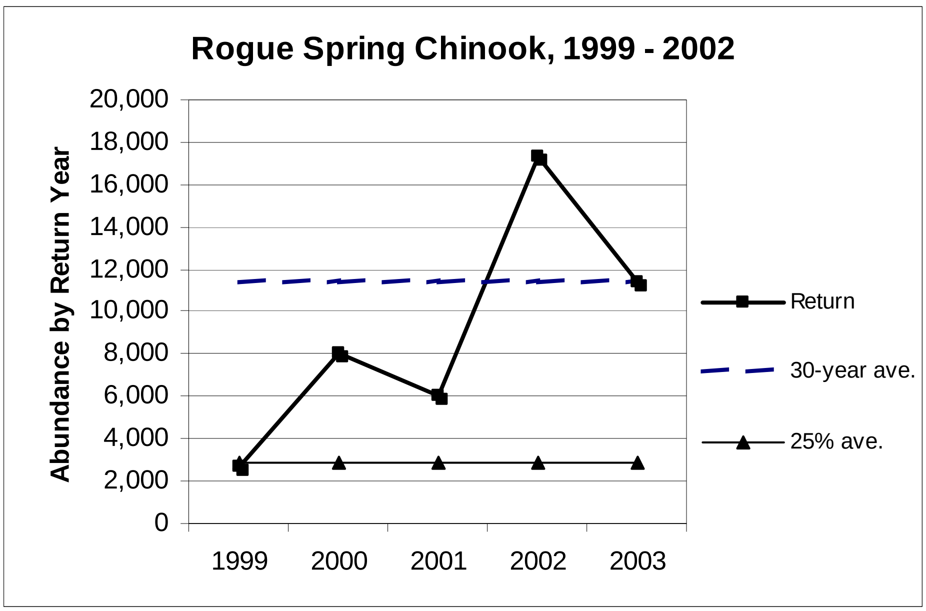
4.4 Spring Chinook Salmon

Rogue spring Chinook salmon consists of a single population upstream from Gold Ray Dam. Adult spring Chinook pass Gold Ray Dam from mid-April through mid-August with peak passage occurring from mid- to late May (Bureau of Reclamation 2005). Spawning is primarily in September and October. Eggs develop in gravel for two months then hatch into sac fry that remain in the gravel for two months into late winter early spring. The juveniles emerge from gravels in the mainstem and Big Butte Creek in February. Before the dam’s winter warming, fry emerged in March. The juveniles rear in the river for four to six months before migrating to the ocean. Smolts migrate to the ocean primarily during July, August, and September. Historically, wild spring Chinook matured in two to six years of age; now, due to selective pressures from harvest and hatchery production, fish are maturing at three to four years of age.

Rogue River spring Chinook salmon spawn primarily in the mainstem of the river. Spring Chinook spawn consistently in the lower portion of Big Butte Creek but not in other tributaries. Most of the spawning is in the lower mile of the creek; the upstream areas (consisting of mostly bedrock) are poor spawning habitat. The Corps of Engineers did a feasibility study of improving spawning habitat in Big Butte Creek, but opportunity was limited because of channel gradient and channel constriction (ODFW 2005b).

The population passed all of the ODFW's criteria except reproductive independence, indicating that near-term sustainability may be at risk. The Rogue River Basin is home to the largest Chinook salmon hatchery program on the Oregon coast. The Cole Rivers Hatchery located at the base of Lost Creek Dam releases approximately 1.9 million spring Chinook smolts annually to mitigate for habitat lost to the dam. Over 10% of the spawners have been of hatchery origin in three of the last five years. From 1995 to 2002, hatchery fish among wild spawners exceeded 10% in every year. Returns of spring Chinook have generally declined since 1970 with a slight increase since 2000. The population exceeded the abundance criterion in four of the last five years (Figure 4-2). The ODFW determined that the threshold number of spring Chinook salmon need to sustain the naturally produced population is greater than 25% (2,847 fish) of the 30-year average levels (11,386 fish) in at least three of the last five years of record (1999-2003).
A Rogue River Spring Chinook Conservation Plan is currently under development (ODFW 2005b). Changes in the water temperature and flow regimes below Lost Creek Dam have

Figure 4-2. Counts of Wild Upper Rogue Spring Chinook Salmon at Gold Ray Dam, 1999-2003



NOTE: Recent returns are compared to the 30-year average return and the 25% average return level criteria for abundance.
Source: ODFW 2005a.

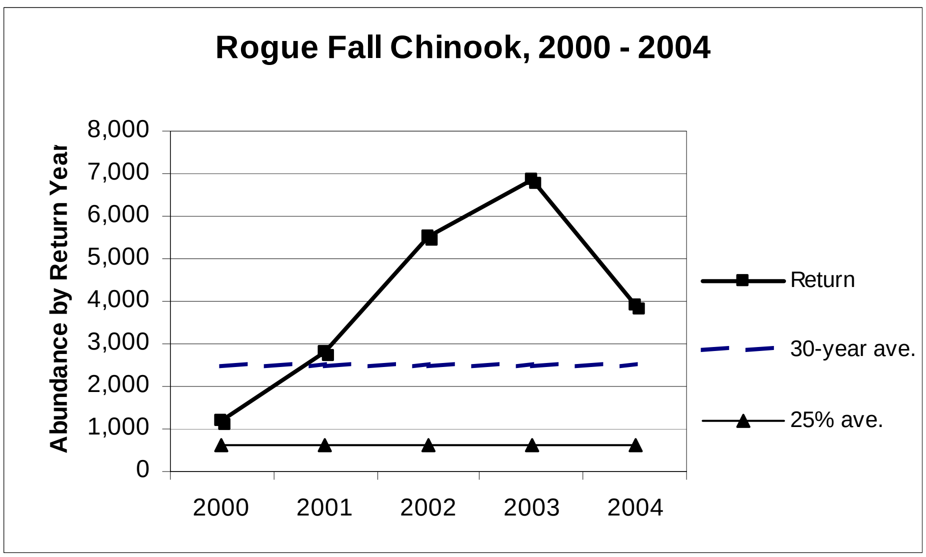
affected juvenile fish (ODFW 2005b). Before the dam, fish grew one inch per month and primarily entered the ocean in September through October. After construction of the dam with warmer water releases in the winter, fish grow faster (more than one inch per month) and enter the ocean in August. The faster juvenile spring Chinook grow, the faster they begin their downstream migration. After construction of the dam, fish emerge from the gravels a month and a half earlier, and this affects survival. Many of the fish emerge in February, which exposes them to flood flows and increased mortality. Before the dam was constructed, juvenile fish would emerge in March or April, which is found to reduce mortality from floods.

4.5 Fall Chinook Salmon

The Rogue fall Chinook is made up of 10 populations, of which the Rogue River (upriver from the Illinois River) is one. Fall Chinook pass Gold Ray Dam from mid-August through late November (Bureau of Reclamation 2005).

According to ODFW's native fish report, the Rogue population meets all six criteria and its near-term sustainability is not at risk. Returns of fall Chinook in 2003 were the second highest in 26 years of monitoring (Figure 4-3). The ODFW determined that the threshold number of fall Chinook salmon need to sustain the naturally produced population is greater than 25% (619 fish) of the 30-year average levels (2,475 fish) in at least three of the last five years of record (2000-2004). The entire range of historically accessible habitat within the basin remains accessible today. The Rogue population typically has less than 10% hatchery spawners.

Figure 4-3. Counts of Wild Upper Rogue Fall Chinook Salmon at Gold Ray Dam, 1999-2003



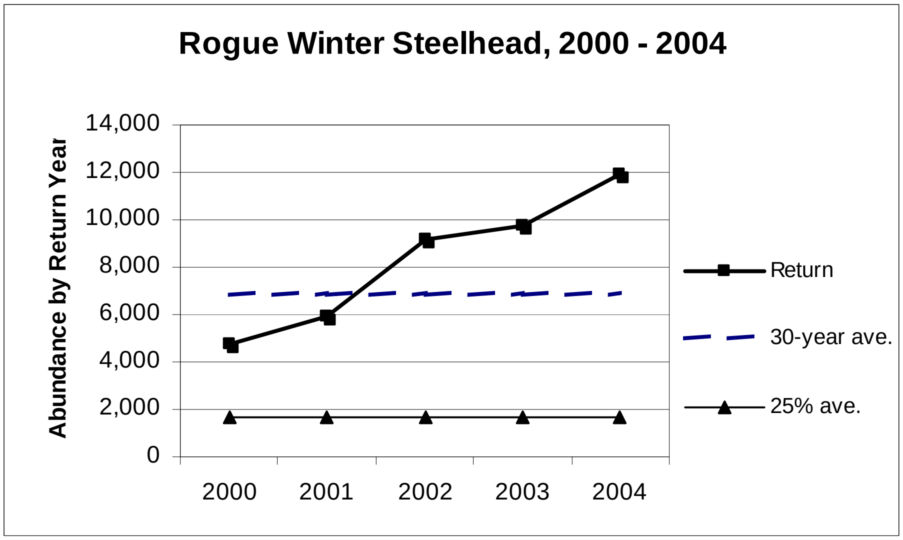
NOTE: Recent returns are compared to the 30-year average return and the 25% average return level criteria for abundance.
Source: ODFW 2005a.

4.6 Winter Steelhead Trout

The mainstem Rogue winter steelhead population encompasses the entire Rogue River Basin upstream from the mouth of the Illinois River with the exception of the Applegate River Basin. Winter steelhead adults pass Gold Ray Dam from early January through mid-May with the peak passage occurring in late March (Bureau of Reclamation 2005). Winter steelhead spawn March through June in medium to small streams and the juveniles rear in the streams from one to five years.

The mainstem Rogue population meets all six of the ODFW's criteria indicating that near-term sustainability is not at risk. The mainstem Rogue winter steelhead population passed the abundance criterion in each of the five years of record. Returns to the mainstem Rogue have

Figure 4-4. Counts of Wild Upper Rogue Winter Steelhead Trout at Gold Ray Dam, 1999-2003



NOTE: Recent returns are compared to the 30-year average return and the 25% average return level criteria for abundance.
Source: ODFW 2005a.

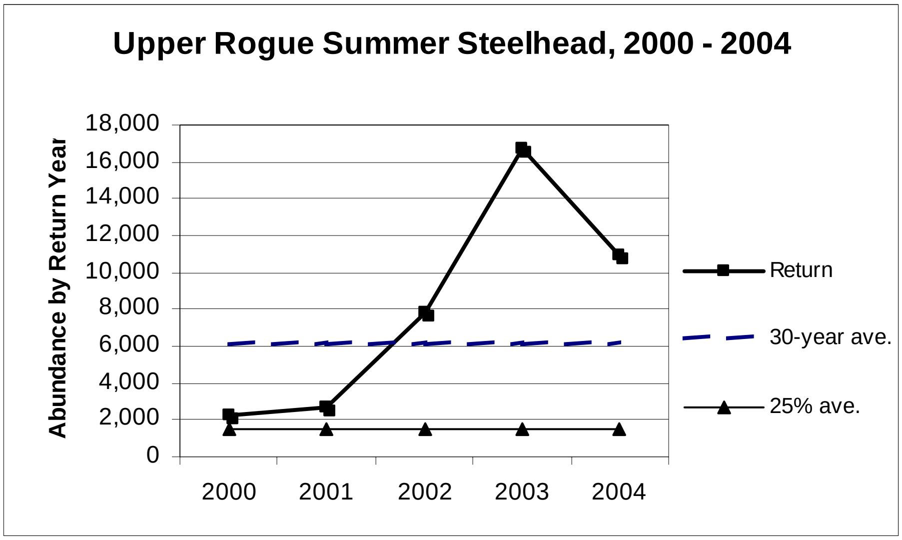
rebounded from record low numbers in the 1990s. Recent returns are among the highest since the 1940s (Figure 4-4). Monitoring at Elk Creek Dam since 1995 has shown that hatchery fish have been between 1% to 2% of the wild spawners.

4.7 Summer Steelhead Trout

The Upper Rogue summer steelhead population encompasses all the watershed of the Rogue River Basin upstream from Gold Ray Dam. Summer steelhead adults pass Gold Ray Dam from early June through mid-December, with peak passage occurring in mid-July and again in late October (Bureau of Reclamation 2005). Spawners can be a variety of ages (some males mature as one-year-olds). Spawning occurs in tributary streams from December through March when flow levels are high and the fish can access higher gradient tributary streams. Steelhead tend to spawn in the headwaters of streams in gradients up to 12% (refer to Map 7, Fish Distribution).

The Upper Rogue summer steelhead population meets all six of the ODFW's criteria indicating that near-term sustainability is not at risk. The Upper Rogue winter steelhead population passed the abundance criterion in each of the five years of record (Figure 4-5). Returns to the Upper Rogue were higher in 2003-2004 than in any year since 1943. Hatchery percentages of the wild spawner population have been less than 7% since monitoring began at the Elk Creek Dam trap in 1994-1995.

Figure 4-5. Counts of Wild Upper Rogue Summer Steelhead Trout at Gold Ray Dam, 1999-2003



NOTE: Recent returns are compared to the 30-year average return and the 25% average return level criteria for abundance.
Source: ODFW 2005a.

4.8 Cutthroat Trout

Coastal cutthroat trout display a wide range of preferred living environments, migration patterns, and spawning behaviors. In the Upper Rogue Watershed, cutthroat trout exhibit three different life history types: fluvial, adfluvial, and nonmigratory.

1. Fluvial populations are fish that undergo in-river migration between smaller tributary streams and the Rogue River.
2. Adfluvial populations migrate between spawning tributaries, and lakes and reservoirs. Juveniles may spend from one to three years in the tributaries before migrating into the lake.
3. Nonmigratory (also called resident) forms of coastal cutthroat trout spend their entire life in small streams and exhibit little instream movement. Resident fish are generally smaller, become sexually mature at a younger age, and may have a shorter life span than migratory cutthroat trout populations. Resident cutthroat trout populations are often isolated with restricted ranges above waterfalls or other barriers but can also coexist with other life history types. Man-made barriers, such as road crossing culverts, can also restrict the movement of resident cutthroat trout.

All life history forms of cutthroat trout tend to spawn in very small (first or second order) tributaries. Young fry move into channel margins and backwater habitats during the first several weeks after emerging from the gravels. During winter high flow periods, juvenile fish occupy low velocity areas in pools and side channels with complex habitat created by large wood.

Migratory fluvial cutthroat trout from the Rogue River have been observed in Elk Creek as part of the fish passage program to transport migratory fish around partially completed Elk Creek Dam. During the 2002-2003 fish return year, for example, 170 wild cutthroat trout were captured at the base of the dam (Satterthwaite et al. 2003). Based on this information, fluvial cutthroat trout are probably present in most of the Upper Rogue Watershed tributaries. Although cutthroat trout populations are not routinely monitored in the Rogue River, reports from fishing guides indicate increasing numbers of cutthroat trout in catches (Hooton 1997). This increase is attributed to the change in angling regulations requiring the release of wild trout.

4.9 Pacific lamprey

Adult Pacific lamprey migrate from the ocean into Oregon coast rivers between April and June with migrations continuing as long as September. Adults overwinter and spawn in tributaries to the Rogue River the following year between February and May. Pacific lamprey populations have declined throughout their range in Canada and the Pacific states. Counts of Pacific lamprey at Gold Ray Dam (1993-2004) have ranged from 155 to 2,370 (Bureau of Reclamation 2005). Pacific lamprey abundance is believed to be far below historical numbers (Kostow 2002). Factors contributing to this decline are poor passage through dams and other obstructions, water diversions, channelization, and other habitat loss. Pacific lamprey is listed as "vulnerable" under the Oregon Sensitive Species list.

4.10 Overview of the Watershed's Fish Habitat Distribution and Barriers

4.10.1 Fish Habitat

Stream channel gradient and valley confinement are key stream channel characteristics that shape fish habitat. Stream gradient is essentially a measure of channel steepness. Fish (primarily resident trout) can usually occupy stream channels with gradients of up to 12%. Valley confinement is an indication of the degree to which a stream channel can interact with the floodplain. Wide valleys with a channel that can migrate across the floodplain, creating complex, high quality fish habitat, characterize unconfined channels. The Channel Types map (Map 8) illustrates channel gradient and valley confinement for the Upper Rogue Watershed stream channels. Channel gradient was determined from maps, calculated for each channel segment, and assigned a category as follows:

Low: 0% to 2% channel gradient

Moderate: >2% to 4% channel gradient

High: >4% to 10% channel gradient

Very High: >10% channel gradient

Valley confinement for the low gradient stream channels was also determined with two categories: unconfined and moderately confined. Channel areas inundated by reservoirs and ditches (primarily water diversion ditches) were also mapped. These channel types are approximate and field verification is necessary for more detailed assessment or restoration project planning.

Table 4-3 shows the distribution of channel habitat types for the Upper Rogue subwatersheds. Based on the mapped stream channels, there are 3,136 miles of stream channels in the entire Upper Rogue Watershed. High gradient (>10%) channels comprise the greatest proportion of the stream network (1,513 miles), but only a small number of these channels contain fish (54 miles). There are a relatively small proportion of low gradient-unconfined streams (270 miles) but most of these streams contain fish. These low gradient-unconfined stream channels are the areas where there is the potential for high quality habitat. Of the streams below Lost Creek Dam, the Big Butte Creek subwatershed contains the greatest length of low gradient-unconfined streams (61 miles).

Table 4-3. Distribution of Channel Habitat Types for the Upper Rogue Watershed

Channel Habitat Type	Channel Habitat Distribution by Subwatershed - Miles of Stream (Fish Bearing)							
	Shady Cove	Lost Creek	Trail Creek	Elk Creek	Big Butte Creek	South Fork Rogue River	Upper Rogue River	Upper Rogue Totals
Very high gradient (>10%)	149.8 (1.4)	60.3 (0.5)	146.0 (0.4)	378.3 (9.4)	128.0 (6.4)	199.9 (13.5)	459.4 (22.7)	1,512.7 (54.3)
High gradient (4 -10%)	77.0 (5.1)	33.0 (7.2)	37.1 (12.6)	86.1 (47.5)	175.6 (62.6)	131.2 (36.3)	331.5 (106.0)	871.8 (277.3)
Moderate gradient (2 - 4%)	24.9 (12.6)	2.7 (1.8)	5.4 (5.1)	24.6 (21.0)	58.1 (34.4)	61.7 (45.5)	113.1 (82.2)	290.4 (202.5)
Low gradient -moderate confined	2.1 (0.1)	0.4 (0.0)	4.6 (4.5)	1.7 (1.5)	16.8 (15.2)	12.0 (10.9)	26.8 (26.0)	67.0 (58.2)
Low gradient - unconfined	51.4 (37.2)	3.8 (2.9)	5.9 (5.9)	20.0 (17.4)	60.6 (42.2)	25.9 (20.2)	101.3 (79.9)	270.3 (206.1)
Ditch	22.8 (0.0)	3.7 (0.0)	0.0 (0.0)	0.0 (0.0)	42.7 (0.0)	6.9 (0.0)	8.3 (0.0)	87.0 (0.0)
Reservoir inundation area	1.1 (0.5)	24.2 (12.9)	0.0 (0.0)	0.0 (0.0)	2.0 (2.0)	0.4 (0.0)	0.0 (0.0)	27.7 (15.4)
Total	329.1 (56.9)	128.0 (25.3)	199.0 (28.5)	510.7 (96.9)	483.9 (162.8)	438.0 (126.3)	1,040.4 (315.8)	3,135.9 (813.7)

NOTE: Numbers in parentheses are miles of fish bearing channels. Refer to Map 8, Channel Types.

The channel habitat type interacts with the other factors that shape streams, such as large wood in the channel, depth and frequency of pools, the frequency of non-pool habitats such as riffles and cascades, and the type of substrate that forms the channel bottom. The ODFW measures all of these habitat components during the aquatic habitat inventories.

Table 4-4 describes the habitat components that interact to form fish habitat. The components described in the table provide a framework for interpreting the aquatic habitat inventory information for subwatersheds below Lost Creek Dam.

Table 4-4. Key Components and Measures of Fish Habitat Quality Measured During Aquatic Habitat Inventories

Habitat Component	Aquatic Inventory Measure	Significance for Fish Habitat
Complexity	Pools over 3 feet deep, number of complex pools, wood pieces, volume, and key pieces	Wood volume, pool depth, and number of complex pools are key measures of habitat complexity. Water depth in pools (particularly pools greater than 3 feet deep) and cover from wood are important for providing feeding and resting areas for fish. Large wood helps to create deep, abundant pools and captures gravel substrate, creating spawning areas and contributing to habitat diversity. A pool area of at least 35% of the channel is the habitat quality benchmark established by the ODFW. Complex pools have more than three pieces of large wood associated with the pool. Large wood is a minimum of 0.49 feet in width and greater than 9.8 feet in length. Key pieces of wood are a minimum of 1.97 feet in width and greater than 32.8 feet in length. Wood volume ratings: *high* – greater than 706 cubic feet per 328 feet of channel.
Habitat type	Percent of the channel area in pools, riffles, cascades, and dry channel	The number and kinds of habitats indicates the suitability for fish. Pools are important for adult and juvenile fish for feeding and resting. Riffles provide spawning habitat and areas for insect (food) production. An array of habitat types is necessary, and unsuitable habitat can be expressed as the dominance of one habitat type (e.g., the reach might be dominated by riffle habitat).
Channel interaction	Width of the valley, landforms that constrain the channel (e.g., hill slopes or terraces), side channels, and channel gradient	Most changes in stream channels occur during high flow events. The formation of multiple channels and the ability of the stream to flow into the broader valley in unconstrained sections helps divert some flow and reduce velocity, providing winter habitat for fish. Side channels provide habitat diversity, including areas for juvenile fish to escape predation. Channel gradients influence habitat-forming flow velocities, and the distribution of habitats. Most of the high quality holding, spawning, and juvenile areas have channel gradients of less than 4%. Most fish cannot access channels with gradients in excess of 12%.
Substrate	Percent of channel area in bedrock, boulders, cobbles, gravels, and silt/sand	High percentages of silt and sand may indicate poor quality spawning habitat, while cobbles and boulders provide important habitat elements. Large areas covered in bedrock can be a result of limited wood to capture gravels and other materials, or a reduction in upstream sources of gravels and other material such as a dam that retains gravels and other materials.

NOTE: Adapted from Foster et al. 1998 and Jacobsen and Thom 2001.

4.10.2 Fish Passage Barriers

Fish must be able to move through the river channel and tributary streams during different phases of their life cycles and in response to changing conditions. Fish passage barriers on the Rogue River and tributary streams can pose a significant problem for fish populations. Dams and road-crossing culverts are examples of potential fish passage barriers that exist in the watershed. Fish passage barriers can completely block fish movement at all times or they can partially block movement for periods of time associated with high or low stream flows. When there is a complete barrier, fish cannot access important areas for spawning or move into cool tributary streams when the Upper Rogue River or other streams warm during the summer months. Partial fish passage barriers can significantly slow the migration of spring Chinook salmon and winter steelhead through the river. Salmon and steelhead will often hold in pools at the base of a barrier waiting for conditions to change, creating problems such as stress on the fish, delayed migration, and opportunities for poaching and predation. Fish passage barriers also restrict movement for spawning cutthroat trout adults and for juvenile fish so that fish passage barriers, particularly road-crossing culverts, can significantly limit cutthroat trout populations and distribution.

Culverts commonly block fish passage by creating a drop at the outlet that is higher than fish can jump. While some adult trout and salmon can jump obstacles greater than 3 feet, most fish cannot jump that high. In addition, water can travel through culverts at velocities high enough to exceed a fish’s swimming ability. The velocity of water moving through the culvert is determined by a number of factors, but the major one is the gradient of the culvert. A very steep culvert (one with a high gradient) will increase velocities more than a properly installed culvert that is placed nearly flat.

Fish passage is a concern for both adult and juvenile fish. Small juvenile fish are the weakest swimmers and can be stopped by a drop as short as 6 inches at a culvert outlet. For this reason, most criteria for fish passage are designed to accommodate juveniles, as this is the most vulnerable life stage. Guidelines for fish passage developed by the ODFW specify that culverts need to be installed at a gradient of less than 0.5% and have no more than a 6-inch drop at the outlet.

Most dams are equipped with fish ladders that allow fish to move above the dam. However, poorly designed fish ladders can hinder fish passage in a number of ways. Migrating fish are “attracted” to greater flow velocities and volumes and often move to the base of the dam where there is more flow than at the fish ladder. In addition, water velocities within fish ladders, particularly at high flows, can block or impede adult or juvenile fish movement up the ladder. Each of these factors can block or slow the progress of the fish over the dam, leaving them vulnerable to predation or poaching.

The Rogue River Basin Fish Access Team extensively surveyed the Rogue River Basin to identify locations of juvenile and adult fish passage barriers. The Team has classified and prioritized the barriers. Prioritization is based on the amount of habitat blocked to fish (core or critical habitat for the species) and the species affected. Great preference in the priority weightings was given to salmon (particularly Coho) and steelhead trout. The identified barriers consist of pushup dams, concrete and other diversion dams, culverts, bridges, and other obstructions. Table 4-5 shows the top 15 ranked fish passage barriers in the Upper Rogue Watershed.

Table 4-5. Top 15 Ranked Fish Passage Barriers in the Upper Rogue Watershed

Priority Points	Sub-watershed	Stream (RM)	Tributary To	Name	Structure Type
10.2	Elk Creek	Elk Creek (RM 1.5)	Rogue River	Elk Creek Dam	Concrete dam
9.1	Elk Creek	Elk Creek (RM 9)	Rogue River	Lower Sturgis	Stop logs
9.1	Elk Creek	Rusty Diversion (RM 9.5)	Rogue River	Trusty Diversion	Concrete dam
8.0	Lost Creek	Lost Creek Dam	Pacific Ocean	Lost Creek Dam	Earth and rock dam
7.1	Elk Creek	Elk Creek (RM 12.5)	Rogue	Upper Sturgis	Stop logs
7.0	Big Butte Creek	N.F. Big Butte Creek (RM 1.5)	Big Butte Creek	Brophy Ditch	Push up dam
7.0	Big Butte Creek	N.F. Big Butte Creek (RM 2.8)	Big Butte Creek	Alberts Ditch	Push up dam
7.0	Big Butte Creek	S.F. Big Butte Creek (RM 1.2)	Big Butte Creek	EPID Diversion	Concrete dam
6.0	Big Butte Creek	Eighty Acre Creek (RM 1.0)	North Fork Butte Creek	Eighty Acre Ditch	Concrete dam with stop logs
6.0	Shady Cove	Reese Creek (0.25)	Rogue River	Caldwell Dam	Push up dam with culvert
6.0	Big Butte Creek	Big Butte Creek (RM 0.7)	Rogue River	Big Butte Creek Weir	Concrete dam/natural falls
6.0	Big Butte Creek	S.F. Big Butte Creek (near mouth of Ginger Creek)	Butte Creek	Butte Falls Hatchery Intake	Concrete dam with stop logs
5.0	Shady Cove	Pond Creek (RM 0.1)	Evans Creek (Tributary to Reese Creek)	Not applicable	Concrete dam with stop logs
5.0	Elk Creek	Jones Creek (RM 0.2)	Elk Creek	Not applicable	Culvert
5.0	Elk Creek	West Branch Elk Creek (RM 0.1)	Elk Creek	Not applicable	Culvert

NOTE: As assessed by the Rogue River Basin Fish Access Team (RBFAT 2000).
RM = river mile as measured from where the stream enters the Rogue River to the obstruction (e.g., the obstruction is 1.5 river miles from the Rogue River).

Elk Creek Dam was ranked as the highest priority fish passage barrier in the Upper Rogue Watershed. Elk Creek Dam (RM 1.7) is one of the three dams authorized by the United States Congress and constructed by the US Army Corps of Engineers in the Rogue Basin. A court order halted construction of Elk Creek Dam in 1987 after the dam's height reached 87 feet. The other Rogue Basin dams, Lost Creek and Applegate, are fully operational.

Spawning anadromous fish blocked by the Elk Creek Dam were to be mitigated by production at the Cole M. Rivers Hatchery on the Rogue River. Mitigation for lost spawning areas was to begin when the dam was fully operational. A diversion tunnel designed to pass juvenile and adult salmonids was built during construction of the dam. Even though hundreds of adult salmonids were observed in the pool downstream of the dam, spawning surveys and trap catches of juvenile salmonids suggested that few adult Coho salmon or steelhead passed through the diversion tunnel during the 1991-1992 run year. These observations lead to the conclusion that few adult salmonids were able to pass Elk Creek Dam (Satterthwaite et al. 1996). The dam blocks access to more than 50 miles of salmon and steelhead habitat (refer to Map 7, Fish Distribution).

In response to the upstream fish passage blockage, the ODFW began a trap-and-haul operation at Elk Creek Dam in the autumn of 1992. Adult salmonids are trapped below the dam and trucked upstream for release. The ODFW monitors the numbers of trapped fish, and there have been studies to assess the spawning success above the dam (Satterthwaite et al. 2003). For example, during the 2002-2003 return year the following fish species were captured and moved above the dam:

Coho: 1,382 wild and 68 hatchery origin

Steelhead: 1,277 wild and 12 hatchery origin

Chinook salmon: 21 wild and 10 hatchery origin

Fish mortality has resulted from the Elk Creek Dam trapping and transport operation. During the 2002-2003 return year, a minimum of one adult Coho salmon and two adult steelhead died, and one adult steelhead was injured (Satterthwaite et al. 2003). Samplers also found 33 dead steelhead lodged against the upstream side of the fish weir. Mortality may be due to the configuration of the weir because the weir often prevents downstream passage of adult fish. Because steelhead can spawn and then return to the ocean, some of the dead steelhead found on the weir may have otherwise survived to make subsequent spawning runs.

Priorities are based on the species and the quality/quantity of habitat that is affected by the barrier. The fish passage barriers identified by ODFW within the Upper Rogue Watershed are shown on the Fish Barriers map (Map 9). The following sections below provide information on fish passage barriers for each of the subwatersheds below Lost Creek Dam.

4.11 Subwatershed Fish Habitat Distribution and Fish Passage Barriers

4.11.1 Shady Cove Subwatershed

Fish Distribution and Populations

The Shady Cove subwatershed includes the Rogue River and tributaries. Key tributaries in the subwatershed include Long Branch, Indian, Dry, Reese, and Brush Creeks. Summer steelhead distribution extends into all of these streams, and Coho salmon are found in Indian and Reese Creeks (refer to Map 7, Fish Distribution).

Channel and Fish Habitat

There are low gradient and unconfined stream sections in Reese Creek, Dry Creek, Long Branch Creek, and Indian Creek (refer to Map 8, Channel Types). The Rogue River Basin Fish Access

Team ranked a pushup dam and another dam on Reese Creek as high priority for action (Table 4-5). The ODFW surveyed aquatic habitat for Indian (1999) and Lewis (1997) Creeks (Table 4-6). Habitat in both of these streams is noteworthy for lack of complex habitat, minimal deep pools, and few pieces of large wood.

Fish Passage Barriers

Table 4-7 outlines the fish passage barriers identified by the ODFW for the Shady Cove subwatershed (Map 9, Fish Barriers). Most of the barriers are culverts.

4.11.2 Lost Creek Subwatershed

Fish Distribution and Populations

The Lost Creek subwatershed includes a small portion of the river below the dam and the river channel that was inundated by Lost Creek Lake. Spring Chinook spawn in the area below the dam and there is a large return of fish to the fish hatchery (refer to Map 7, Fish Distribution).

Channel and Fish Habitat

This subwatershed has the greatest length of channels that are inundated. Lost Creek Lake covers more than 24 miles of stream channel (refer to Map 8, Channel Types). There are no ODFW aquatic habitat inventories in this subwatershed.

Fish Passage Barriers

Table 4-8 outlines the fish passage barriers identified by ODFW for the Lost Creek subwatershed (refer to Map 9, Fish Barriers). The major barrier in this portion of the subwatershed is Lost Creek Dam, which blocked access to historic spring Chinook and steelhead spawning areas (refer to previous discussion).

4.11.3 Trail Creek Subwatershed

Fish Distribution and Populations

A study of fish production in the selected Upper Rogue tributaries (Satterthwaite et al. 1996) found evidence that migratory adult salmonids spawned in most of the streams in the Trail Creek subwatershed (refer to Map 7, Fish Distribution).

The study indicated notable differences between streams in the Elk Creek and Trail Creek subwatersheds. The lower portions of the West Fork of Trail Creek stop flowing in most summers, while most of the channels in Elk Creek maintain flows. The study concludes: “If juvenile salmonids fail to migrate before flow ceased, then fry-to-adult survival rates would probably be lower for salmonids produced in the Trail Creek Basin as compared to counterparts produced in Elk Creek” (Satterthwaite et al. 1996). Based on 1995 sampling, however, ODFW found that fish production rates in Elk Creek and Trail Creek are comparable to or better than other watersheds in the Rogue Basin..

Table 4-6. ODFW Stream Habitat Data for Tributaries Within the Rogue River – Shady Cove Subwatershed

Stream	Survey Date	Reach	Lengh (feet)	Gradient (unitless)	Valley Type	Channel Form	Active Channel Width (feet)	% Pool	% Bed-rock	% Riffle Gravel	Deep Pools (mile)	Complex Pools (mile)	% Shade	LWD Pieces/ 100 feet	LWD Volume/ 100 feet	Key LWD/ 100 feet	No. Pools/ 100 feet	Large Boulders/ 100 feet
Indian Creek	1999	1	97,42.9	2.4	WF	US	37.1	12.9	10	25	0.24	0.0	43	0.3	0.06	0.0	0.24	5.49
Indian Creek	1999	2	90,62.5	3.8	MV	CH	43.6	21.5	14	19	0.24	1.12	64	2.4	1.2	0.03	0.28	11.83
Lewis Creek	1999	1	89,06.6	2.6	CT	CA	24.6	17.3	0	28	0.24	0.0	54	0.3	0.3	0.0	0.33	2.14
Lewis Creek	1999	2	57,54.2	9.5	CT	CA	18.0	12.0	0	45	0.24	0.0	65	0.6	1.2	0.1	0.38	2.52
Lewis Creek	1999	3	21,20.2	13.2	MV	CH	13.5	12.3	0	32	0.24	0.0	79	3.1	6.1	0.3	0.63	6.43

NOTES:

Valley types: OV = open V-shaped; MV = moderate V-shaped; SV = steep V-shaped; CT = constraining terraces; MT = multiple terraces; WF = wide active floodplain. LWD = large wood. Refer to Foster et al. 1998 for guide to interpreting ODFW aquatic habitat data.

Table 4-7. Shady Cove Subwatershed Fish Passage Barriers

Map ID	Barrier Name	RM	Comments	Owner
34	Unnamed falls	1.5	Falls location and height information provided by Jerry Vogt (ODFW).	Unknown
37	Hammel No. 2 Dam	0.4		Private
38	Unnamed culvert	0.1	Velocity barrier. Creek dry (7/97).	Jackson County
39	Unnamed culvert	1.3	Above culvert is a concrete slide with 20% slope. Juvenile barrier. Inhibits adult passage in low flows. Lower 75% of culvert is backflow.	ODOT
41	Unnamed falls	3.6	Falls height and location information provided by Jerry Vogt (ODFW).	Unknown
44	Unnamed culvert	0.4		Jackson County
45	Unnamed falls	0.1		Unknown
56	Unnamed culvert	0.0		Jackson County
57	Walch Dam	0.0		Hermit Falk
58	Unnamed culvert	0.0		Jackson County
59	Unnamed culvert	0.0	Juvenile step/velocity barrier.	Jackson County
60	Unnamed culvert	0.0	Stream is dry (7/97).	Jackson County
61	Unnamed culvert	0.0	Br. #246.	Jackson County
62	Unnamed culvert	0.0	12 culvert has slope 7%.	ODOT
63	Unnamed culvert	0.0	Possible step/velocity barrier.	ODOT
65	Unnamed culvert	0.0	Velocity barrier. Creek dry (7/97).	ODOT
68	Unnamed culvert	0.0	Step/velocity barrier. Dry except isolated pools (7/97).	Jackson County
69	Unnamed culvert	0.0		Jackson County
70	Unnamed culvert	0.0	Step/velocity barrier in low-moderate flows. Juvenile fish in pool below culvert.	Jackson County

NOTES: Identified by the ODFW. For locations, refer to Map 9, Fish Barriers. ODOT = Oregon Department of Transportation. RM = river mile as measured from where the stream enters the Rogue River to the obstruction (e.g., the obstruction is 1.5 river miles from the Rogue River).

Table 4-8. Lost Creek Subwatershed Fish Passage Barriers

Map ID	Barrier Name	RM	Comments	Owner
27	Unnamed culvert	10.2		Jackson County
46	Lost Creek Dam	6.4		U.S. Army Corps of Engineers
47	Cole Rivers Hatchery Diversion Dam	7.7	The hatchery is operated by the Oregon Department of Fish & Wildlife with federal funds. It was built by the U.S. Army Corps of Engineers.	Oregon Department of Fish & Wildlife/U.S. Army Corps of Engineers
49	Rogue River Concrete Dam at Hatcher Intake	6.2	¼ to ½ mile of fish production above barrier. Lost Creek Dam is above this barrier. No anadromous fish passed.	Oregon Department of Fish & Wildlife

NOTES: Identified by the ODFW. For locations, refer to Map 9, Fish Barriers. ODOT = Oregon Department of Transportation. RM = river mile as measured from where the stream enters the Rogue River to the obstruction (e.g., the obstruction is 1.5 river miles from the Rogue River).

While production rates did not differ between small streams in the two subwatersheds, large streams in the Trail Creek subwatershed produced subyearling trout (steelhead and cutthroat) at greater rates than streams in the Elk Creek subwatershed (Table 4-9). Rearing densities of subyearling trout were greater in the tributaries of Trail Creek than in the tributaries of Elk Creek.

Table 4-9. Densities of Subyearling Salmonids Estimated by Electrofishing 13 Streams in Trail Creek and Elk Creek Subwatersheds, 1995

Subwatershed	Stream	Fish/mile (95% Confidence Interval)	
		Trout	Coho Salmon
Small Streams Near the Rogue River			
Trail Creek	Canyon	1,714 (± 563)	1,714 (± 885)
Elk Creek	Berry	277 (± 137)	0 (± 0)
Small Streams			
Trail Creek	Romine	1,714 (± 518)	0 (± 0)
Trail Creek	Chicago	2,086 (± 343)	0 (± 0)
Elk Creek	Alco	835 (± 296)	0 (± 0)
Elk Creek	Middle	916 (±457)	0 (± 0)
Elk Creek	Jones	217 (± 109)	0 (± 0)
Large Streams			
Trail Creek	Wall	5,740 (± 2,470)	217 (± 71)
Trail Creek	West Fork	3,954 (± 1,114)	2,473 (± 2,562)
Elk Creek	West Branch	537 (± 177)	2,343 (± 505)
Elk Creek	Flat	943 (± 181)	5 (± 5)
Elk Creek	Bitterlick	591 (± 169)	0 (± 0)
Elk Creek	Sugarpine	328 (± 55)	1,910 (± 690)

NOTES: Satterthwaite et al. 1996.

Among small streams, densities averaged 1,849 trout/mile in the two Trail Creek streams sampled and 657 trout/mile in the four Elk Creek streams sampled (Table 4-9). Large streams in the Trail Creek subwatershed also had greater densities of subyearling trout in comparison to the Elk Creek subwatershed. This finding is interesting because lack of flow in Trail Creek does not appear to be affecting fish densities or production.

No Coho salmon were found in small Trail Creek streams except Canyon Creek, which is near the mouth of Trail Creek. Coho salmon were present in both of the large streams in the Trail Creek subwatershed (Wall and West Fork) and three of the four large streams in the Elk Creek subwatershed (West Branch, Flat, and Sugarpine). In these large streams, the densities of Coho salmon averaged 1,389 fry/mile in the Trail Creek subwatershed and 1,064 fry/mile in the Elk Creek subwatershed.

In both the Trail and Elk Creek subwatersheds, production rates for subyearling trout were greatest in small streams that were closest to the Rogue River (Table 4-10). There were minimal differences in the production rates between the two watersheds for the small streams farther from the Rogue River, ranging between 3,219 and 6,437 fry/mile. In contrast to the results from the small stream samples, trout production in the large streams differed between the subwatersheds. Production rates for large streams averaged 12,279 trout fry/mile in the Trail Creek subwatershed and 851 fry/mile in the Elk Creek subwatershed.

Spawner numbers and habitat quality affect salmonid production in streams. Because there are no dramatic differences in habitat quality between Elk and Trail Creek streams, the authors conclude that a difference in the number of spawners is the most likely factor that would account for the difference in production rates of subyearling trout within the larger tributaries.

Table 4-10. Estimates of Minimum Production of Subyearling Trout in 12 Streams in the Trail Creek and Elk Creek Subwatersheds, 1995

Watershed	Stream	Miles of Habitat	Fish Produced	Production/mile (95% Confidence Interval)
Small Streams Near the Rogue River				
Trail Creek	Canyon	0.70	13,537	19,279 (+ 563)
Elk Creek	Berry	1.39	19,344	13,959 (+ 136)
Small Streams				
Trail Creek	Romine	0.50	2,445	4,858 (+ 518)
Trail Creek	Chicago	0.93	3,453	3,705 (+ 343)
Elk Creek	Alco	1.16	3,888	3,346 (+ 296)
Elk Creek	Middle	0.42	1,559	3,745 (+457)
Elk Creek	Jones	0.58	3,792	6,561 (+ 109)
Large Streams				
Trail Creek	Wall	1.63	20,339	12,444 (+ 2,470)
Trail Creek	West Fork	1.21	14,686	12,119 (+ 1,114)
Elk Creek	West Branch	4.92	3,545	721 (+ 177)
Elk Creek	Flat	3.50	4,217	1,205 (+ 182)
Elk Creek	Bitterlick	3.34	2,091	626 (+ 169+-)

NOTES: Production estimates are minimums because weir traps did not operate during the entire period that fry migrated from streams. Trout include summer steelhead, winter steelhead, migratory cutthroat trout, and resident cutthroat trout. Satterthwaite et al. 1996.

Channel and Fish Habitat

There are low gradient and unconfined stream sections in the lower stream reaches of Trail Creek and West Fork Trail Creek (refer to Map 8, Channel Types). The ODFW surveyed aquatic habitat for the following streams in the Trail Creek subwatershed (Table 4-11): Canyon (1996), Chicago (1993), Clear (1996) Dead Horse (1996), Romine (1993), Trail (1996), Wall (1996), Walpole (1993), and West Fork Trail (1993). Habitat quality is variable, with generally better habitat quality in the upper reaches and headwater streams. The lower reaches are characterized by less complex habitat and little wood in the channel. Clear Creek, Dead Horse Creek, and the upper reaches of Canyon Creek (reach 3), Trail Creek (reaches 5 and 6), and West Fork Trail Creek (reach 3) all have abundant wood volumes. However, because these areas are higher in the watershed, many of these streams have higher channel gradients, which limit the quality of the habitat. All of these aquatic habitat inventories are more than 10 years old. Stream habitat can change dramatically through time in response to floods and other events and these habitat conditions may have changed since the inventory.

Fish Passage Barriers

Table 4-12 outlines the fish passage barriers identified by the ODFW for the Trail Creek subwatershed (refer to Map 9, Fish Barriers). Most of the human-made barriers are culverts.

Table 4-11. ODFW Stream Habitat Data for Tributaries Within the Rogue River – Trail Creek Subwatershed 2 Pages

Stream	Survey Date	Reach	Length (feet)	Gradient (unitless)	Valley Type	Channel Form	Active Channel Width (feet)	% Pool	% Bed-rock	% Riffle Gravel	Deep Pools (mile)	Complex Pools (mile)	% Shade	LWD Pieces/ 100 feet	LWD Volume/ 100 feet	Key LWD/ 100 feet	No. Pools/ 100 feet	Large Boulders/ 100 feet
Canyon Creek	1996	1	2,890.6	3.9	CT	CA	23.3	13.7	0	18	0.6	0.0	91	0.8	1.8	0.2	0.39	6.67
Canyon Creek	1996	2	73,56.3	8.8	MV	CH	19.0	12.1	0	27	0.7	0.0	93	1.8	7.3	0.7	0.36	15.97
Canyon Creek	1996	3	16,58.9	10.9	MV	CH	14.4	0.0	0	0	0.0	0.0	82	3.7	16.3	1.7	0.0	16.11
Chicago Creek	1993	1	15,380.3	5.8	MV	CH	17.4	2.3	0	11	0.1	0.0	99	2.2	5.0	0.0	0.05	6.33
Clear Creek	1996	1	36,20.9	10.7	MV	CH	11.2	2.1	0	19	0.0	0.0	93	2.3	7.2	0.5	0.17	3.65
Dead Horse Creek	1996	1	43,40.4	12.3	SV	CH	27.2	8.0	0	30	2.4	0.0	94	2.6	7.4	0.5	0.41	23.04
Romine Creek	1993	1	11,626.6	8.2	OV	CH	21.7	2.6	0	29	0.0	0.0	94	2.2	3.7	0.0	0.03	6.07
Trail Creek	1996	1	14,800.9	1.0	CT	CA	52.5	50.4	0	16	2.5	0.0	66	0.1	0.2	0.0	0.25	3.81
Trail Creek	1996	2	14,336.7	1.7	CT	CA	46.9	34.1	0	18	1.3	0.0	76	0.1	0.5	0.0	0.25	8.57
Trail Creek	1996	3	3,690.1	2.8	MV	CH	36.7	26.0	0	12	1.2	0.0	83	0.0	0.1	0.0	0.30	9.86
Trail Creek	1996	4	6,887.1	4.6	MV	CH	32.2	19.0	0	15	2.5	0.0	93	0.7	1.5	0.2	0.37	13.56
Trail Creek	1996	5	6,184.0	7.0	CT	CA	26.6	14.8	0	18	1.8	0.0	94	2.2	8.9	0.9	0.44	17.72
Trail Creek	1996	6	6,941.0	9.1	MV	CH	19.0	15.6	0	22	2.4	0.0	92	3.4	14.53825	1.4	0.46	10.60
Wall Creek	1996	1	13,505.9	4.7	MV	CH	34.1	26.8	0	19	4.0	0.1	89	1.6	4.5	0.5	0.55	14.17
Wall Creek	1996	2	35,57.9	17.1	MV	CH	16.7	9.3	0	30	2.2	0.0	93	1.8	5.4	0.5	0.51	18.52
Walpole Creek	1993	1	15,431.5	8.7	OV	CH	13.5	3.6	0	31	0.0	0.0	93	3.8	5.3	0.0	0.07	3.26
West Fork Trail Creek	1993	1	15,161.8	3.2	CT	TC	33.1	27.0	0	35	0.0	0.0	62	0.8	0.8	0.0	0.24	1.08

Table 4-11. ODFW Stream Habitat Data for Tributaries Within the Rogue River – Trail Creek Subwatershed 2 Pages

Stream	Survey Date	Reach	Length (feet)	Gradient (unitless)	Valley Type	Channel Form	Active Channel Width (feet)	% Pool	% Bed-rock	% Riffle Gravel	Deep Pools (mile)	Complex Pools (mile)	% Shade	LWD Pieces/ 100 feet	LWD Volume/ 100 feet	Key LWD/ 100 feet	No. Pools/ 100 feet	Large Boulders/ 100 feet
West Fork Trail Creek	1993	2	19,464.2	2.2	OV	CH	30.8	12.3	0	28	0.0	0.0	83	1.8	2.2	0.0	0.20	4.09
West Fork Trail Creek	1993	3	1,459.4	5.4	MV	CH	26.9	1.9	0	30	0.0	0.0	90	3.8	10.6	0.0	0.0	11.86
Canyon Creek Tributary	1996	1	2,886.3	10.9	MV	CH	19.4	6.6	0	23	0.0	0.0	94	2.3	9.9	0.9	0.3	16.95

NOTES:

Valley types: OV = open V-shaped; MV = moderate V-shaped; SV = steep V-shaped; CT = constraining terraces; MT = multiple terraces; WF = wide active floodplain. LWD = large wood. Refer to Foster et al. 1998 for guide to interpreting ODFW aquatic habitat data.

Table 4-12. Trail Creek Subwatershed Fish Passage Barriers

Map ID	Barrier Name	RM	Comments	Owner
35	Unnamed falls	7.8	Falls height and location information provided by Jerry Vogt (ODFW)	Unknown
36	Unnamed culvert	0.9	Double culvert	Jackson County
40	Unnamed culvert	0.1	Velocity barrier. Dry (7/97)	ODOT
42	Unnamed culvert	0.0	Culvert is perched. Juvenile step barrier. Inhibit/prohibit adult passage in low flows.	ODOT
43	Unnamed Falls	6.9	Falls location and height information provided by Jerry Vogt (ODFW).	Unknown
66	Unnamed culvert	0.0	Not listed in state barrier log. Velocity barrier.	ODOT
67	Unnamed culvert	0.0	Juvenile step barrier. Velocity barrier. Dry (7/97)	ODOT

NOTES: Identified by the ODFW. For locations, refer to Map 9, Fish Barriers. ODOT = Oregon Department of Transportation. RM = river mile as measured from where the stream enters the Rogue River to the obstruction (e.g., the obstruction is 1.5 river miles from the Rogue River).

4.11.4 Elk Creek Subwatershed

Fish Distribution and Populations

Map 7, Fish Distribution, displays the extent of resident and anadromous fish use in the Elk Creek subwatershed. The Elk Creek subwatershed accounts for about 9.5% of the area accessible to anadromous salmonids that pass Gold Ray Dam on the Rogue River (Satterthwaite et al. 1996). Coho salmon, steelhead trout, and resident and migratory forms of cutthroat trout spawn in the Elk Creek subwatershed. Small numbers of spring Chinook salmon (<200) and fall Chinook salmon (<50) spawn in the lower portions of Elk Creek during autumn high flows. Migratory cutthroat trout from the Rogue River also spawn in Elk Creek. No accounts of anadromous cutthroat trout spawning in Elk Creek were noted.

A study of fish production in the Upper Rogue Basin (Satterthwaite 1996) concluded that streams in the Trail Creek subwatershed were most comparable to the Elk Creek subwatershed because they share similar geological, hydrological, and biological features. The study found that streams in the Big Butte Creek subwatershed were less comparable because streams in that subwatershed tended to have higher gradients, were less accessible, and most had irrigation diversions.

The production of Coho salmon varies dramatically between small streams in the Elk and Trail Creek subwatersheds with a clear relationship to distance from the Rogue River (Table 4-13). Canyon Creek in the Trail Creek subwatershed produced about 30,576 Coho salmon fry/mile although none were produced in Berry Creek, a tributary of Elk Creek also near the Rogue River. Satterthwaite (1996) speculates that the absence of Coho fry in Berry Creek (which is below the Elk Creek Dam) may indicate that all of the adult spawners were trapped and released above the dam. Juvenile Coho salmon were observed in Berry Creek prior to the start of trapping adult salmon at the base of the dam. In both watersheds, small streams further from the Rogue River produced fewer than 16 Coho salmon fry/mile.

With the exception of Canyon Creek, large streams tended to produce the most subyearling Coho salmon fry in both Trail and Elk Creek subwatersheds with production rates ranging between 0 and 6,437 fry/mile. Flat Creek and Bitterlick Creek, both large streams in the Elk Creek subwatershed, produced almost no Coho salmon. Poor adult returns could account for these differences. However, large numbers of Coho salmon were present in West Branch Creek. Habitat quality differences between Flat and Bitterlick (low Coho numbers) and West Branch (high Coho numbers) streams could account for the differences.

The Elk Creek Watershed appears to the have capability of producing a large proportion of the wild anadromous salmonids originating in the Upper Rogue River Basin. In comparison to steelhead, a greater proportion of the Coho salmon passing over Gold Ray Dam have returned to Elk Creek. Between 1992 and 2003, returns of wild Coho salmon to the collection facility on Elk Creek ranged from 40 to 982 fish (Table 4-14). Returns of Coho to Elk Creek during this period accounted for 4.5% to more than 30% of the wild Coho salmon that passed the fish counting station at Gold Ray Dam. In contrast, during the same period, returns of wild steelhead to the collection facility on Elk Creek accounted for 1.3% to 6.7% greater steelhead production in the Elk Creek subwatershed (Table 4-15). Given the habitat capacity of the streams in the

Table 4-13. Estimates of Minimum Production of Subyearling Coho Salmon in 12 Streams in the Trail and Elk Creek Subwatersheds, 1995

Watershed	Stream	Miles of Habitat	Fish Produced	Production/mile (95% Confidence Interval)
Small Streams Near the Rogue River				
Trail Creek	Canyon	0.32	9,704	30,619 (± 885)
Elk Creek	Berry	--	0	0 (± 0)
Small Streams				
Trail Creek	Romine	0.50	7	12 (± 0)
Trail Creek	Chicago	--	0	0 (± 0)
Elk Creek	Alco	1.16	4	3 (± 0)
Elk Creek	Middle	--	0	0 (± 0)
Elk Creek	Jones	--	0	0 (± 0)
Large Streams				
Trail Creek	Wall	0.87	243	280 (± 71)
Trail Creek	West Fork	0.63	4,135	6,524 (±2,562)
Elk Creek	West Branch	2.73	7,294	2,610 (± 505)
Elk Creek	Flat	0.69	3	5 (± 5)
Elk Creek	Bitterlick	--	0	0 (± 0)

NOTES: Production estimates are minimums because weir traps did not operate during the entire period that fry migrated from streams. Satterthwaite et al. 1996.

Table 4-14. Return of Wild Coho Salmon to Elk Creek Collection Facility as Compared to Those That Passed Gold Ray Dam, 1992-93 through 2000-01

Return Year	Elk Creek Return	Gold Ray Dam Counts	Percent of Total Run
92-93	40	--	--
93-94	76	756	10.1%
94-95	232	3,265	7.1%
95-96	349	3,345	10.4%
96-97	319	3,516	9.1%
97-98	982	4,566	21.5%
98-99	404	1,310	30.8%
99-00	288	1,417	20.3%
00-01	698	15,652	4.5%

NOTE: Returns of wild Coho salmon over Gold Ray Dam could not be estimated for the 1992-93 return year.

Elk Creek subwatershed, Satterthwaite (2001) stated that Elk Creek should produce a comparable percentage of Coho salmon and steelhead because both species spawn in tributaries rather than the Rogue River.

Table 4-15. Return of Wild Steelhead to Elk Creek Collection Facility as Compared to Those That Passed Gold Ray Dam, 1992-93 through 2000-01

Return Year	Elk Creek Return	Gold Ray Dam Counts	Percent of Total Run
92-93	112	5,541	2.0%
93-94	105	8,022	1.3%
94-95	201	12,515	1.6%
95-96	283	12,344	2.3%
96-97	493	14,144	3.4%
97-98	224	5,018	4.4%
98-99	351	9,232	3.8%
99-00	265	7,343	3.6%
00-01	572	8,596	6.7%

The most important Coho spawning and rearing streams in the subwatershed are Elk Creek, West Branch of Elk Creek, Flat, Surgarpine, and Bitterlick Creeks (refer to Map 7, Fish Distribution). Satterthwaite (2000) investigated the variability in juvenile Coho distribution in these streams between 1996 and 2002. The extent of habitat used by rearing Coho fry will vary from year to year depending on spawning distribution and habitat variables such as flow. The upstream distribution of Coho fry was variable for all of the surveyed streams, with the most variability in Bitterlick (Table 4-16).

Table 4-16. Variability in Upstream Distribution of Coho Salmon Fry in Five Creeks Within the Elk Creek Subwatershed, 1996-2000

Year	Tributary				
	Elk	West Branch	Flat	Sugarpine	Bitterlick
	- - - - - - - - - - - - - - - - - - - River Miles -				
1996	14.3	2.2	2.0	5.5	2.5
1997	13.0	2.4	2.5	4.1	1.2
1998	13.0	2.5	3.4	5.7	1.9
1999	13.0	2.7	2.0	4.5	2.5
2000	13.0	2.9	2.0	4.1	2.4
2001	13.0	2.4	2.0	4.3	0.9
2002	13.0	2.9	2.9	4.6	3.0
Mean	13.2	2.5	2.4	4.7	2.1
±95% CI	0.4	0.2	0.6	0.6	0.7

NOTES: The distribution was determined through snorkel surveys. A waterfall at river mile 13.0 on Elk Creek appears to be a barrier to spawning adults. Satterthwaite et al. 2000.
CI = confidence interval; in 95% of the samples, the mean would be plus or minus the confidence interval (e.g., 13.2 ± 0.4 for Elk Creek counts. RM = river mile as measured from where the stream enters the Rogue River to the obstruction (e.g., the obstruction is 1.5 river miles from the Rogue River).

Channel and Fish Habitat

There are low gradient and unconfined stream sections in the lower stream reaches of Elk Creek and Sugarpine Creek (refer to Map 8, Channel Types). The ODFW surveyed aquatic habitat for the following streams in the Elk Creek subwatershed (Table 4-17): Brush (1993), Button (1994), Elk (1994), Hawk (1991), Sugarpine (1991), Swanson (1994), West Branch of Elk Creek (1991), and Alder (1993). Most of the inventoried streams have almost no complex pools and little wood in the channels. All of these inventories were completed more than 10 years ago and, given the probable changes in stream habitat, all of these streams should be re-inventoried.

Fish Passage Barriers

Table 4-18 outlines the fish passage barriers identified by the ODFW for the Elk Creek subwatershed (refer to Map 9, Fish Barriers). With the exception of Elk Creek Dam (refer to the previous discussion), most of the human-made barriers are culverts.

4.11.5 Big Butte Creek

Fish Distribution and Populations

Map 7, Fish Distribution, illustrates the range of fish use in the Big Butte Creek subwatershed. The subwatershed is an important production area for Coho salmon and steelhead. Chinook salmon spawn in the lower section of the creek. The ODFW tracks spawning Coho salmon in Big Butte Creek (Table 4-19). Between 1999 and 2004, the estimated number of Coho spawners ranged from zero (2000) to more than 2000 fish (2002). In a comparison to Little Butte Creek, the two subwatersheds have variable spawner numbers that do not track in parallel (i.e., large number of spawners in Big Butte Creek one year do not correspond to large numbers in Little Butte Creek).

Channel and Fish Habitat

A study of fish production in the Upper Rogue River Basin (Satterthwaite et al. 1996) concluded that streams in Big Butte Creek were less comparable to Elk and Trail Creeks: streams in the Big Butte subwatershed tended to have higher gradients, were less accessible, and most had irrigation diversions. There are low gradient and unconfined stream sections with reaches of Big Butte Creek, the North and South Forks, McNeil Creek, Bowen Creek, and Willow Creek (refer to Map 8, Channel Types). The ODFW has completed aquatic habitat inventories for the following streams (Table 4-20): Box (1996 and 1997), Crowfoot (1996), Dog (1996), Jackass (1995), McNeil (1999), Clark (1999), Twincheria (1997), North Fork Big Butte Creek (1996), and South Fork Big Butte Creek (1997). With the exception of McNeil and Clark Creeks, most of the inventoried streams had few complex pools and very limited wood pieces and volumes. The greater number of complex pools and larger wood volumes within McNeil and Clark Creeks is probably due to their watershed location and historical land management practices.

Fish Passage Barriers

In comparing the Upper Rogue River subwatersheds, Big Butte Creek has the greatest variety of fish passage issues: culverts, dams, and water diversions (refer to Map 9, Fish Barriers). The Rogue River Basin Fish Access Team ranked a number of irrigation diversions in the watershed

Table 4-17. ODFW Stream Habitat Data for Tributaries Within the Elk Creek Subwatershed

Stream	Survey Date	Reach	Length (feet)	Gradient	Valley Type	Channel Form	Active Channel Width (feet)	% Pool	% Bed-rock	% Riffle Gravel	Deep Pools (mile)	Complex Pools (mile)	% Shade	LWD Pieces/ 100 feet	LWD Volume/ 100 feet	Key LWD/ 100 feet	No. Pools/ 100 feet	Large Boulders/ 100 feet
Brush Creek	1993	1	5,369.4	3.5	CT	TC	23.3	1.2	0	29	0	0	94	3.4	4.0	0	0	7.31
Brush Creek	1993	2	11,913.6	7.7	MV	CH	12.8	0	0	30	0	0	89	3.1	4.4	0	0	2.55
Button Creek	1994	1	9,846.0	4	CT	TC	24.0	9.4	0	20	0.2	0	73	1.2	1.9	0.1	0	8.56
Elk Creek	1994	1	1,978.2	3.9	SV	CB	37.1	35.8	0	14	6.0	0	68	1.4	1.2	0	0	35.57
Elk Creek	1994	2	13,880.9	3.5	CT	CA	32.5	31.3	0	22	0.5	0	70	1.1	2.1	0.1	0	5.08
Hawk Creek	1991	1	4,392.9	2.2	CT	TC	20.7	9.3	0	17	0	0	63	0	0	0	0.33	11.27
Hawk Creek	1991	2	2,323.4	3.8	MV	CH	23.0	3.1	0	5	0	0	65	0.0	0	0	0.12	5.54
Sugarpine Creek	1991	1	2,696.3	2	MT	US	42.7	4.9	0	8	0	0	63	0.1	0.4	0	0.20	6.37
Sugarpine Creek	1991	2	8,948.9	2.1	CT	TC	30.5	12.5	0	0	0	0	53	0.1	0	0	0.42	9.59
Sugarpine Creek	1991	3	7,686.4	2.9	MV	CH	18.4	14.4	0	11	0	0	69	0.1	0	0	0.70	21.94
Sugarpine Creek	1991	4	13,18.3	2.5	CT	TC	26.6	13.9	0	25	0	0	82	0	0	0	0.71	33.27
Swanson Creek	1994	1	2,201.1	9.1	CT	TC	14.8	0.7	0	30	0	0	81	1.8	4.8	0.3	0	4.13
West Branch Elk Creek	1991	1	1161.2	3.1	CT	CT	15.7	6.5	0	75	0	0	75	0.1	0	0	0	0
West Branch Elk Creek	1991	2	1,818.3	2.5	CH	MV	22.0	12.8	0	69	0	0	68	0.6	0.2	0	0	0
West Branch Elk Creek	1991	3	897.4	2.2	CT	CT	24.6	21.4	0	70	0	0	68	0.6	0.3	0	0	0
West Branch Elk Creek	1991	4	1,0024.1	2.9	CH	MV	20.3	13.2	0	48	0	0	67	1.2	0.3	0	0	0
West Branch Elk Creek	1991	5	1,032.5	4.7	CB	SV	18.0	26	0	60	0	0	56	0.1	0.1	0	0	0
West Branch Elk Creek	1991	6	9,228.1	4.6	VH	MV	24.6	71	0	66	0	0	80	0.4	0.1	0	0	0
Alder Creek	1993	1	19,328.0	8.7	MV	CH	15.7	1.5	0	29	0	0	97	5.0	5.9	0	0.02	13.0

NOTES: Valley types: OV = Open V-shaped; MV = moderate V-shaped; SV = steep V-shaped.
Channel forms: CT = constraining terraces; MT = multiple terraces; WF = wide active floodplain.
Refer to Foster et al., 1998 for guide to interpreting ODFW aquatic habitat data.

Table 4-18. Fish Passage Barriers Identified by ODFW for the Elk Creek Subwatershed.

Map ID	Barrier Name	RM	Comments	Owner
14	Unnamed culvert	0.6		Jackson County
15	Unnamed Falls	1.9	Falls height and location information provided by Jerry Vogt (ODFW)	Unknown
17	Unnamed culvert	0.0	Juvenile step barrier. Inhibit/prohibit adults in low flows	Jackson County
18	Unnamed Falls	0.3	Falls location and height information provided by Randy Frick (USFS)	Unknown
19	Unnamed culvert	2.6		Jackson County
20	Unnamed Falls	6.5	Falls location information provided by Jerry Vogt (ODFW)	Unknown
26	Unnamed culvert	0.0		Jackson County
28	Unnamed Falls	2.2	Falls height and location information provided by Jerry Vogt (ODFW)	Unknown
29	Unnamed culvert	0.0	Juvenile step barrier has baffles	Jackson County
30	Unnamed culvert	0.2	Br. #400.	Jackson County
31	Unnamed culvert	0.1	Br. #s 398 and 399.	Jackson County
32	Unnamed culvert	0.0		Jackson County
33	Elk Creek Dam	1.7	This was listed as the top priority in the Upper Rogue in the Rogue Fish Access Team analysis.	U.S. Army Corps of Engineers

NOTES: Identified by the ODFW. For locations, refer to Map 9, Fish Barriers. ODOT = Oregon Department of Transportation. RM = river mile as measured from where the stream enters the Rogue River to the obstruction (e.g., the obstruction is 1.5 river miles from the Rogue River).

Table 4-19. Estimated Spawner Abundance for Little Butte and Big Butte Creeks, 1999-2004

Survey Year	Big Butte Creek			Little Butte Creek		
	Estimated Spawning Miles	Miles Surveyed	Estimated Wild Spawner Abundance	Estimated Spawning Miles	Miles Surveyed	Estimated Wild Spawner Abundance
1999	16	1.8	13	31	3.5	64
2000	16	2.5	0	32	5.3	897
2001	15	1.0	225	32	5.6	811
2002	17	2.4	2,002	43	4.8	177
2003	15	2.5	518	44	4.8	445
2004	--	--	--	48	8.2	2,069

NOTES: The estimates are based on ODFW's random spawning surveys. Estimated spawning miles ranged from 15 miles (2001) to 17 miles (2002). More than 95% of the observed fish were of wild origin. Data from Jacobs et al. 2001, 2002 and ODFW 2006.

as high priority for action (Table 4-5). Butte Falls and the Butte Falls fish hatchery also have fish passage issues (Richard Harrington, Butte Falls, personal communication). There are also a number of culverts that appear to be fish passage issues (Table 4-21).

4.12 Recommendations and Possible Council Actions

Chapter 6, Watershed Conditions and Project Recommendations, provides a synthesis of the key factors affecting fish populations and gives an overview of watershed improvement opportunities.

Table 4-20. ODFW Stream Habitat Data for Tributaries Within the Big Butte Creek Subwatershed

Stream	Survey Date	Reach	Length (feet)	Gradient	Valley Type	Channel Form	Active Channel Width (feet)	% Pool	% Bed-rock	% Riffle Gravel	Deep Pools (mile)	Complex Pools (mile)	% Shade	LWD Pieces/ 100 feet	LWD Volume/ 100 feet	Key LWD/ 100 feet	No. Pools/ 100 feet	Large Boulders/ 100 feet
Box Creek	1996	1	1,036.1	5.1	CT	CT	17.7	15.2	0	34	6.2	0	79	2.5	2.9	0.2	0.68	3.57
Box Creek	1996	2	4,531.1	8.6	CT	CA	13.8	5.8	0	23	0.9	0	92	3.1	9.9	0.7	0.2	9.09
Box Creek	1997	3	6,023.6	5.6	MV	CH	20.0	6.3	0	30	0.5	0	71	1.8	5.0	0.2	0.12	1.1
Crowfoot Creek	1996	1	6,264.1	3.7	MV	CH	23.3	16.5	0	22	0	0	69	0.8	0.4	0	0.3	3.44
Dog Creek	1996	1	1,604.7	6	CT	TC	27.6	12.8	0	16	0	0	81	1.9	0.5	0	0.68	15.75
Dog Creek	1996	2	4,086.2	7.3	MV	CH	20.7	8.9	0	19	0.7	0	86	2.5	3.9	0.3	0.4	14.67
Dog Creek	1996	3	2,537.9	6.6	CT	TC	13.1	3.7	0	16	1.3	0	86	2.0	2.1	0.1	0.27	16.26
Dog Creek	1996	4	8,731.1	9.4	MV	CH	18.4	3.8	0	21	0.4	0	87	4.6	10.6	0.9	0.2	16.24
Dog Creek	1996	5	5,516.0	13.1	MV	CH	14.4	3.3	0	25	0	0	79	4.6	8.1	0.2	0.12	9.24
Jackass Creek	1995	1	6,959.7	3.5	CT	TC	12.8	12.4	0	24	0.4	0	53	0.6	1.0	0	0.6	8.98
Jackass Creek	1995	2	3,884.7	4.6	WF	CA	9.2	10.6	0	23	0	0	62	1.5	1.8	0	0.5	17.42
Jackass Creek	1995	3	7,004.6	4.8	CT	TC	13.5	12	0	27	0.2	0	67	1.8	2.5	0.1	0.36	7.18
McNeil Creek	1999	1	17,348.0	0			0	0	0	0	0	0	0	0	0	0	0	0
McNeil Creek	1999	2	3,230.8	1.8	CT	CA	20.0	44.5	2	13	0.5	1.0	59	1.4	0.6	0	0.46	13.56
McNeil Creek	1999	3	3,550.7	2.4	MV	CH	26.6	47.3	14	28	1.7	0.6	66	1.0	1.7	0.1	0.47	7.89
McNeil Creek	1999	4	2,357.4	1.6	CT	CT	20.0	58.7	21	16	0.9	1.8	53	1.2	0.5	0	0.52	0.76
South Fork Clark Creek	1999	1	14,781.9	5.9	MV	CH	11.2	3.3	8	33	0.1	0.4	87	2.5	4.8	0.1	0.13	2.93
Twincheria Creek	1997	1	4,172.8	0.8	OV	CH	19.0	45.3	0	54	4.6	0	48	3.0	6.8	0.3	0.71	9.6
Twincheria Creek	1997	2	2,010.9	2.2	MV	CH	17.4	28.5	0	63	3.0	0	68	2.8	6.0	0.2	0.59	3.01
Twincheria Creek	1997	3	5,156.1	4.3	MV	CH	13.1	17.4	0	63	0.7	0	64	2.1	5.4	0.1	0.28	12.68
Twincheria Creek	1997	4	3,767.9	5.8	MV	CH	19.0	14.8	0	65	1.5	0	88	4.9	10.0	0.4	0.23	9.29
North Fork Big Butte Creek	1996	1	8,721.6	2.8	MV	CH	63.3	9.2	0	11	3.0	0	75	3.4	9.0	0.3	0.16	27.61
North Fork Big Butte Creek	1996	2	6,952.8	0.8	MT	US	48.9	19.8	0	19	1.6	0	55	0.8	2.1	0.1	0.09	2.19
North Fork Big Butte Creek	1996	3	3,388.9	1.3	MV	CH	59.4	21.2	0	13	3.6	0	72	1.7	5.9	0.2	0.28	7.1
North Fork Big Butte Creek	1996	4	13,055.4	1.2	MT	CA	28.2	28.2	0	32	2.3	0	58	0.9	1.2	0.1	0.36	3.19
North Fork Big Butte Creek	1996	5	4,552.4	1.7	CT	TC	32.5	41.5	0	34	4.5	0	63	0.8	2.8	0.2	0.41	2.38
North Fork Big Butte Creek	1996	6	5,815.2	1.6	CT	TC	26.9	39.6	0	26	4.2	0	62	1.0	3.0	0.2	0.31	2.63
North Fork Big Butte Creek	1996	7	3,412.2	2.2	CT	CA	21.7	17.9	0	36	0	0	72	92.3	4.0	0.3	0.37	1.18
North Fork Big Butte Creek	1996	8	11,137.7	1.9	CT	TC	23.2	29.5	0	23	1.1	0	65	2.0	8.4	0.5	0.2	1.05
North Fork Big Butte Creek	1996	9	3,266.9	3.4	CT	TC	18.4	7.1	0	30	0	0	86	1.7	6.3	0.5	0.24	5.04

Table 4-20. ODFW Stream Habitat Data for Tributaries Within the Big Butte Creek Subwatershed

Stream	Survey Date	Reach	Length (feet)	Gradient	Valley Type	Channel Form	Active Channel Width (feet)	% Pool	% Bed-rock	% Riffle Gravel	Deep Pools (mile)	Complex Pools (mile)	% Shade	LWD Pieces/ 100 feet	LWD Volume/ 100 feet	Key LWD/ 100 feet	No. Pools/ 100 feet	Large Boulders/ 100 feet
North Fork Big Butte Creek	1996	10	5,346.4	4.8	CT	TC	11.8	7.1	0	30	0	0	82	3.7	14.6	1.0	0.24	2.69
Clark Creek	1999	1	5,267.0	5.4			0	0	0	0	0	0	0	0	0	0	0	0
Clark Creek	1999	2	3,418.1	7.4	MV	CH	20.3	6.9	18	25	2.3	0	83	3.8	7.7	0.5	0.2	6.74
Clark Creek	1999	3	2,819.7	9.3	SV	CR	21.3	8.6	29	30	1.4	0.7	79	2.3	5.6	0.4	0.18	2.19
Clark Creek	1999	4	11,508.4	3.7	MT	CA	22.0	9	12	40	0.3	0.9	89	1.6	1.9	0.1	0.26	2.32
Clark Creek	1999	5	2,478.1	5.2	MV	CH	15.7	3.4	13	22	0	0.7	97	1.3	2.1	0.1	0.17	3.87
South Fork Big Butte Creek	1997	1	4,518.9	1.7	MV	CH	49.5	27	0	5	2.8	0	67	1.2	2.7	0.1	0.19	11.44
South Fork Big Butte Creek	1997	2	2,751.4	1.9	MV	CH	54.1	19.2	0	7	2.1	0	62	1.4	1.1	0	0.14	39.23
South Fork Big Butte Creek	1997	3	4,012.0	1.3	MV	CH	63.3	12.5	0	5	1.9	0	55	0.7	0.9	0	0.15	18.24
South Fork Big Butte Creek	1997	4	5,976.7	0.2	OV	CH	78.7	29.7	0	12	1.5	0	46	0.6	0.7	0	0.17	3.95
South Fork Big Butte Creek	1997	5	8,759.9	0.9	MV	CH	65.9	40.2	0	23	3.4	0	46	0.3	0.4	0	0.16	4.1
South Fork Big Butte Creek	1997	6	7,998.1	1	OV	CH	50.5	20.9	0	23	1.9	0	49	0.9	1.9	0	0.12	2.73
South Fork Big Butte Creek	1997	7	5,022.2	1.6	MV	CH	44.0	50.2	0	30	2.8	0	58	0.9	2.2	0	0.24	9.17

NOTES: Valley types: OV = Open V-shaped; MV = moderate V-shaped; SV = steep V-shaped.
Channel forms: CT = constraining terraces; MT = multiple terraces; WF = wide active floodplain.
Refer to Foster et al., 1998 for guide to interpreting ODFW aquatic habitat data.
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Table 4-21. Fish Passage Barriers Identified by ODFW for the Big Butte Creek Subwatershed.

Map ID	Barrier Name	RM	Comments	Owner
1	Insufficient flow	4.1		Unknown
6	Willow Creek (Jackson)	4.5		City of Medford
10	Unnamed culvert	0.0	Juvenile step barrier.	Jackson County
11	Butte Falls	1.6	Butte Falls is assumed. Ref. 50062 reported the falls as unladdered and having marginal passage.	Unknown
12	Butte Falls Fish Hatchery	2.2		Oregon Department of Fish & Wildlife.
13	Unnamed culvert	2.0	Juvenile step barrier. Large bridge (50' span) with concrete step below. Bridge 265	Jackson County
16	Unnamed culvert	1.0	Juvenile step/velocity barrier. Step would prohibit/inhibit adult passage in low/mod. flows.	Jackson County
21	Unnamed Falls	4.6	Falls height and location information provided by Jerry Vogt (ODFW)	Unknown
22	Unnamed culvert	2.9	Juvenile velocity barrier	Jackson County
23	Unnamed Falls	1.3		Unknown
24	Unnamed culvert	1.9		Jackson County
25	Unnamed culvert	0.4	20' long cascade below culvert. (15%)	Jackson County
54	Unnamed culvert	0.0		Jackson County
55	Unnamed culvert	0.0	Step bar. 0.8 miles south of Hwy. 62.	Jackson County

NOTES: Identified by the ODFW. For locations, refer to Map 9, Fish Barriers. ODOT = Oregon Department of Transportation. RM = river mile as measured from where the stream enters the Rogue River to the obstruction (e.g., the obstruction is 1.5 river miles from the Rogue River).

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