

Status of Coastal Cutthroat Trout in Oregon

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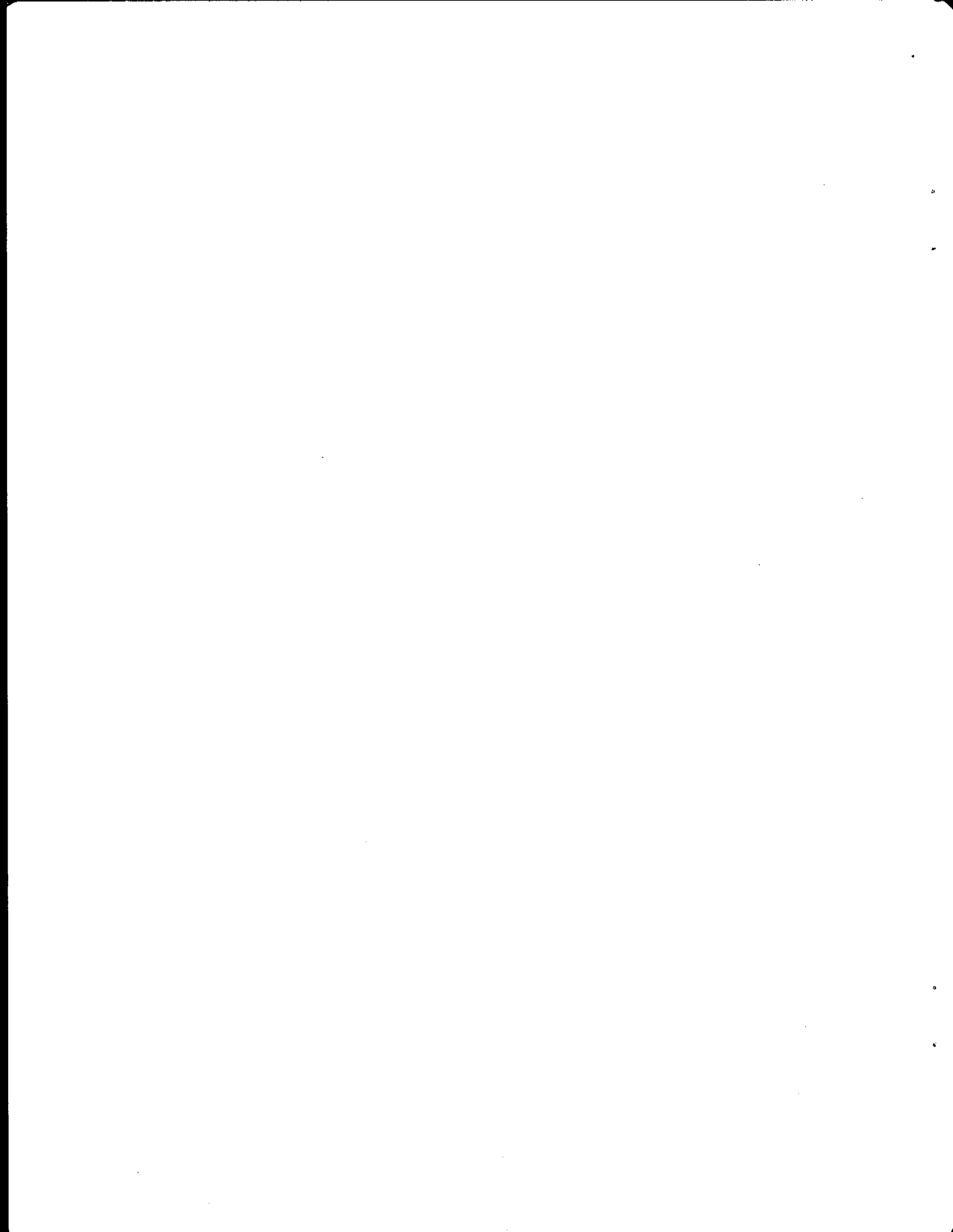
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Abstract

The status of coastal cutthroat trout in Oregon is reviewed utilizing data from a variety of published and unpublished sources from the Oregon Department of Fish and Wildlife. All four life-history types (resident, fluvial, adfluvial and anadromous) are present in cutthroat trout populations in Oregon coastal and lower Columbia River streams. The various combinations represented in these life-history strategies are probably the most complex of any salmonid in Oregon. Resident cutthroat trout are widespread and are believed to be the dominant trout in most headwater tributaries. Multiple age classes are consistently present. Populations appear to be stable but likely lower in abundance than historic levels due to habitat loss. Fluvial cutthroat trout are likely present in most larger river systems in western Oregon. Data available indicate a mixture of healthy populations and others of unknown status, although they are not routinely monitored in most streams. Most fluvial cutthroat trout populations have been exposed to hatchery trout releases (either rainbow or cutthroat trout) at one time or another and are easily accessible to angling. Adfluvial cutthroat trout are present in a variety of geologic settings above and below barriers to anadromous fish. Most populations isolated above barriers to anadromous fish have not been exposed to releases of hatchery trout and are lightly fished. These populations are likely healthy due to low angler use and stable habitat. Many adfluvial populations in low-elevation lakes accessible to anadromous fish have been exposed to releases of hatchery trout and correspondingly are more heavily fished upon. These populations are not routinely monitored and their status is unknown. Anadromous cutthroat trout are believed present in most coastal and lower Columbia River streams that do not have upstream passage barriers in lower reaches. Data from dam counts and angler creel surveys on mid and north coast and lower Columbia streams indicate anadromous cutthroat trout have likely undergone a significant decline in the past decade. Potential causative factors include: a significant decline in near ocean productivity since the mid-1970s, genetic and fishery consequences of widespread use of hatchery sea-run cutthroat trout throughout Oregon coastal and lower Columbia River streams, and reduction of stream and estuary habitat complexity due to land and water use activities. Proposed conservation measures include termination of hatchery trout stocking in streams with coastal cutthroat trout, more restrictive angling regulations, habitat projects that benefit cutthroat trout, and intensified population monitoring.

Introduction

Three subspecies of cutthroat trout (*Onchorynchus clarki*) are present in Oregon. These include Lahontan cutthroat trout (*O.c. henshawi*) in southeastern Oregon, coastal cutthroat trout (*O.c. clarki*) west of the Cascade Mountains, and a disjunct segment of west-slope cutthroat trout (*O.c. lewisi*) in the John Day River basin of northeastern Oregon.

The purpose of this paper is to review the status of the coastal subspecies of cutthroat trout in Oregon, as well as to propose future conservation measures for their long-term sustainability. Detailed status descriptions of Lahontan and westslope cutthroat trout,

as well as other native salmonid species in Oregon, are included in a recently published Oregon Department of Fish and Wildlife (ODFW) report titled, "Biennial Report on the Status of Wild Fish in Oregon" (Kostow, 1995).

Most of the data included in this review of coastal cutthroat trout is from a variety of unpublished sources found in District and Research Section files of ODFW. Data sources include results of creel surveys, electrofishing, snorkeling, and genetic analysis. Fish distribution information has been recently confirmed by coast-wide stream surveys conducted by staff of the Aquatic Inventory Research Project of ODFW during the past six years and by Oregon Department of Forestry (ODF) surveys associated with forest practice operations. Additional information was gathered through a series of interviews conducted over four years with current and past ODFW employees, many with extensive experience managing coastal cutthroat trout.

Specific status information in this report is partitioned into three geographic regions: coastal streams, lower Columbia River tributaries and Willamette basin streams. Also included is an update of progress by the National Marine Fisheries Service (NMFS) on their status review of Umpqua River sea-run cutthroat trout under the Endangered Species Act (ESA), as well as a summary of action items proposed by ODFW to conserve and sustain coastal cutthroat trout in Oregon.

Population Status

Coastal Streams

All four life-history types (resident, fluvial, adfluvial, and anadromous) are present in cutthroat trout populations in Oregon coastal and lower Columbia River streams. The various combinations represented in these life-history strategies are probably the most complex of any salmonid in Oregon.

Resident (non-migratory) cutthroat trout occur in small headwater streams and exhibit little instream movement. Fluvial populations are fish that undergo in-river migrations between small spawning tributaries and main river sections downstream, similar to ocean migrations of sea-run cutthroat trout. Adfluvial populations migrate between spawning tributaries and lakes. Anadromous or sea-run populations migrate to the ocean (or estuary) for usually less than a year before returning to freshwater. Anadromous cutthroat trout either spawn during the first winter or spring after their return or undergo a second ocean migration before maturing and spawning in freshwater.

A genetic survey of coastal cutthroat trout in Oregon has been initiated only recently, and the relationship among populations with the various life histories remains unknown. It is uncertain if resident, fluvial and anadromous life-history patterns represent distinct breeding groups or if they are life-history variations within the same breeding group.

Resident.—Resident cutthroat trout are widespread and are believed to be the dominant trout in most headwater tributaries and small streams along the coast that directly

enter the ocean (Lorenson et al., 1993). There are exceptions, however, in some head-water areas above natural barriers in the Nehalem (Salmonberry), Umpqua, Coquille, Sixes, Elk, Rogue, and Chetco rivers where resident rainbow trout predominate.

The status of resident cutthroat trout in coastal streams has been assessed based on observations made during fish sampling in tributary streams. These observations show that multiple age classes of cutthroat trout are consistently present in a vast network of Oregon coastal streams. Numerous independent cutthroat trout populations exist upstream from impassable barriers to migration. This wide distribution and consistent presence indicates that overall, cutthroat trout are very secure in Oregon coastal streams. However, it is uncertain if cutthroat trout observed in tributary streams downstream from migration barriers are juvenile sea-runs, fluvial juveniles, or resident fish.

Studies were conducted by ODF during the summer of 1993 to determine the upstream distribution of game fish. In coastal streams, cutthroat trout are consistently the game fish species with the widest distribution. Based on streams surveyed in townships along Oregon's south, mid and north coast, there was an 80% chance that cutthroat trout would be present in a stream channel with a drainage area of greater than 40 ha. (100 acres). The study also determined that there are about 1.6 km. of stream containing cutthroat trout per square kilometer of drainage area, indicating a dense network of streams containing cutthroat trout (Lorenson et al., 1993).

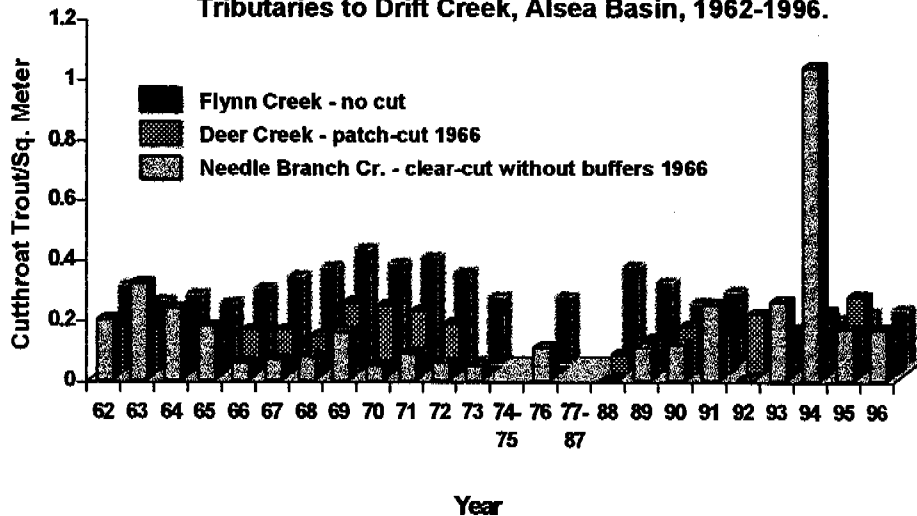
The effects of timber harvesting in small coastal tributary streams were examined in the Alsea Watershed Study and other follow-up investigations (Moring and Lantz 1975; Reeves et al. 1997; Gregory et al. in press). Needle Branch was clear-cut without buffers in 1966 (the prevailing practice on private lands prior to the Oregon Forest Practices Act). The abundance of juvenile cutthroat trout declined to about on-third of its pre-logging size and remained depressed for about 25 years; it appears to have recovered in the 1990s. There was no measurable change in the juvenile trout populations in Deer Creek (patch-cut with buffers) or Flynn Creek (unlogged control) (Figure 1).

Genetic analysis during 1991 of several populations of cutthroat trout in the Coquille River basin indicated that an exceptionally high level of genetic divergence exists among populations in the basin. In some cases, this divergence was explained by the presence of natural physical barriers between populations in the form of waterfalls. In other cases, however, a high level of genetic divergence was observed in the absence of any physical barriers. This result suggests some populations mix very little with adjacent populations even though they have the opportunity to do so (Currens et al., 1992). Samples of Elk River populations in 1992-93 (Griswold, 1996) also found high levels of genetic divergence in tributaries to Elk River, similar to Currens work in the Coquille.

ODFW is continuing to collect samples of coastal cutthroat trout for genetic analysis along the entire Oregon coast as well as samples from lower Columbia and Willamette River tributaries. This is a cooperative project with the NMFS. Results of this analysis will be published as part of the NMFS coast-wide assessment of the status of sea-run cutthroat trout under the ESA. This assessment is scheduled for completion in 1998.

Fluvial.—Fluvial cutthroat trout are likely present in larger river systems along the coast. Fluvial populations are believed to be present in the following systems: Nehalem (Rock Creek), Nestucca, Wilson (Little North Fork), Yaquina (Big Elk Creek), Siletz, Alsea (Five Rivers and Fall Creek), Siuslaw (Lake Creek), North Umpqua (Little River and

Figure 1. Cutthroat Trout Abundance in Three Small Tributaries to Drift Creek, Alsea Basin, 1962-1996.



Coquille and Rogue (Elk Creek, Applegate and Illinois rivers) (Tomasson, 1978; Johnson et al., 1994; Wyant and Ferrell, 1995). There are likely many more of these populations that have not yet been recognized.

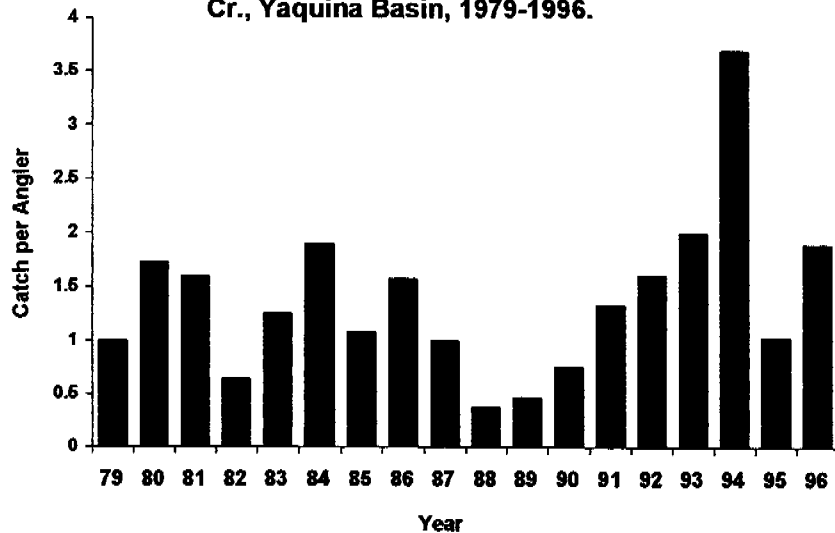
Since most fluvial populations in coastal streams are not routinely monitored, their status is unknown. Virtually all larger river systems along the Oregon coast have received hatchery trout (either rainbow or cutthroat) at one time or another in the last decade. The long-term genetic consequences of hatchery trout releases on fluvial cutthroat trout is unknown. However, all hatchery trout releases in coastal streams that could affect fluvial or anadromous cutthroat trout have been discontinued.

The fishery for wild fluvial cutthroat trout on Big Elk Creek (Yaquina River) has been monitored in late May each year since 1979. Catches have been stable and sustainable through this time period. No hatchery trout have been released into the Yaquina Basin after 1960 (Figure 2).

Fluvial cutthroat trout populations have recently been reaffirmed in Elk Creek (Rogue River) and the mainstem Rogue River as part of a fish passage program to transport returning fluvial fish upstream around the partially completed Elk Creek Dam (Wyant and Ferrell, 1995). Although cutthroat trout in the mainstem Rogue River are not routinely indexed, anecdotal reports from angling guides indicate increasing numbers of cutthroat trout in their catches in the last four years. They attribute this increase to a change in angling regulations requiring release of all wild trout and "half pounder" (20-40cm.) sum-

mer steelhead in the Rogue Basin since 1992. In addition, most spawning and rearing tributaries to the Rogue River have been closed to all angling since 1994. (M. Evenson, ODFW, personal communication). Hatchery rainbow trout releases in the mainstem Rogue and Applegate rivers were discontinued after 1993.

Figure 2. Catch Per Angler of Cutthroat Trout Big Elk Cr., Yaquina Basin, 1979-1996.

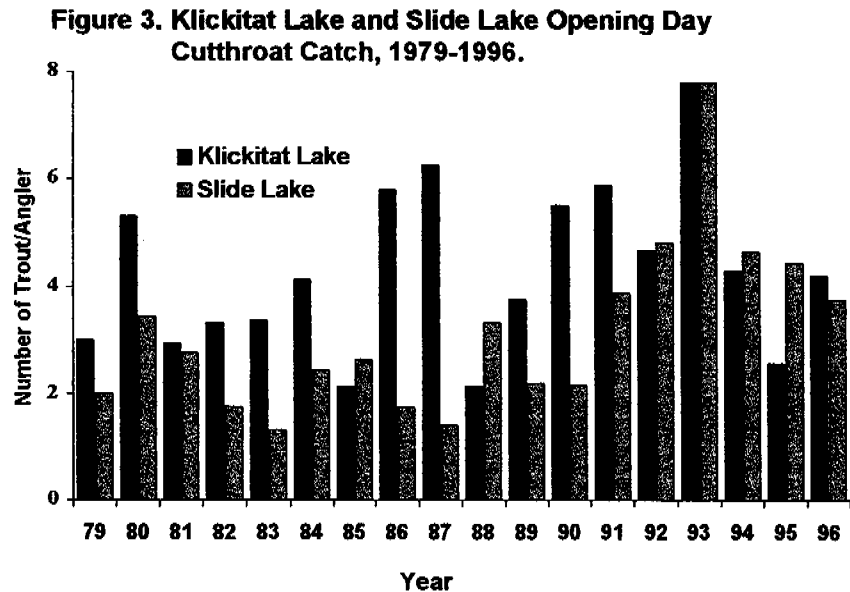


Fluvial cutthroat trout in the North Umpqua River have been monitored periodically by use of radio telemetry since 1993 (Waters, 1993; Johnson, et al., 1994). Population abundance in the North Umpqua basin is unknown but likely in the range of 1,000-2,000 fish, based on data from surveys in 1993, 1994 and 1995. This estimate is based on numbers of fish observed and expanded for available habitat, and on catch rates in trout and summer steelhead fisheries observed in angler creel surveys on the North Umpqua River. Actual counts of fluvial adults in mainstem Steamboat and Canton creeks have ranged from 74 to 88 fish in key holding pools in 1993, 1994, and 1995. These two streams are index areas for numerous other cutthroat trout spawning and early rearing areas in the North Umpqua basin.

Since 1992, ODFW, Oregon State Police, U.S. Forest Service, and volunteers have funded and implemented the "Umpqua River Fish Watch." In this cooperative project to prevent poaching, intensive 24-hour per day monitoring of critical holding and staging pools is conducted during summer months on major fluvial and sea-run cutthroat trout and summer steelhead trout spawning tributaries in the North and South Umpqua River.

Fishery regulations to protect adult fluvial and sea-run cutthroat trout (cutthroat trout >12" prohibited to harvest) have been in effect in the Umpqua River Basin since 1986. Regulations were made even more restrictive and beneficial to Umpqua River cutthroat trout in 1995 with the year-round closure to angling of >90% of the basin where cutthroat trout occur, as well as total prohibition of cutthroat trout harvest in areas open to angling.

In addition, all trout angling was closed effective in 1997 in stream areas where cutthroat trout occur in the Umpqua Basin. Time and area closures will be implemented as well on winter steelhead fisheries in the Smith River, South Umpqua River, and Cow Creek to further protect sea-run cutthroat trout kelts (spawned out adults) and smolts.



Adfluvial.—Adfluvial cutthroat trout are present in two types of geologic settings along the Oregon coast. Several isolated adfluvial populations rear in natural lakes above barriers to anadromous fish. Grassy (N. Nehalem River), Buttermilk (Yaquina River), Slide and Klickitat (Asea River), and Loon (Umpqua River) lakes are examples of such populations. Most populations isolated above barriers to anadromous fish have not been exposed to releases of hatchery trout and are lightly fished. These populations are likely healthy due to low angler use and stable habitat. As an example, fisheries for adfluvial cutthroat trout in Slide and Klickitat lakes have been monitored on opening day since 1979 (Figure 3). The catch in both fisheries indicates stable, sustainable production.

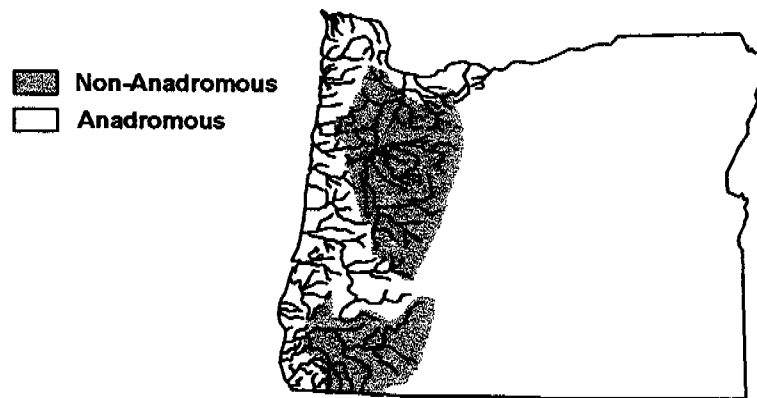
Non-isolated adfluvial populations are likely present in low-elevation lakes along the coast that have stream outlets to the ocean. In these cases, sea-run cutthroat trout are also present and the relationship between the two populations is unclear. Examples of such settings are Devils, Sutton, Mercer, Siltcoos, Tahkenitch, Tenmile, and Floras lakes. Many adfluvial populations accessible to anadromous fish have been exposed to releases of hatchery trout and correspondingly are more heavily fished upon. These populations are not routinely monitored and their status is unknown.

Anadromous.—Anadromous cutthroat trout are believed to be present in all Oregon coastal streams that do not have upstream passage barriers near their confluence with the ocean (Figure 4). By far the majority of coastal streams do not have natural barriers blocking anadromous passage. However, some direct ocean tributaries between the Pistol and Chetco rivers (Burnt Hill, Lone Ranch, Shigh and Ransom creeks) now have isolated cut-

throat trout populations as a result of passage barriers caused by the construction of Highway 101 in the 1960s.

Hatchery sea-run cutthroat trout smolts have been released for many decades in streams along the Oregon coast (Figure 5). The primary broodstock used, at least over the last few decades, was one developed from the wild population in the Alsea River. A second broodstock was developed more recently from the Nehalem River. In the last 10 years, however, there has been a systematic effort to switch hatchery cutthroat trout releases from streams to standing waters. Discontinued stream releases include Winchuck (750), Chetco (2,000), Pistol (750), Hunter (1,000), Coquille (4,000), Millicoma (2,000) rivers and Eel Creek, all discontinued in the mid-1980s; Kilchis (3,000), Trask (3,000) and Three (2,000) rivers, discontinued after 1992; and Scholfield Creek (4,000), Nestucca (5,000), Tillamook (8,000) and mainstem Nehalem (10,000) rivers, discontinued after 1993. Stocking programs discontinued after 1994 include the Necanicum (10,000), North Nehalem (3,400), and Smith (4,000) rivers. Releases of sea-run cutthroat trout smolts in the final remaining coastal streams, the Salmon (3,000), Siletz (10,000), Alsea (10,000) and Siuslaw (30,000) rivers, which occurred in 1995 and 1996, reflect significant reductions; elimination of these programs is scheduled after 1996. The genetic consequences of these programs are unknown. Beginning in 1997, no hatchery trout will be released into Oregon streams in areas where sea-run cutthroat trout occur.

Figure 4. Distribution of Coastal Cutthroat Trout in Oregon



Estimates of Abundance.—Lack of inventory data generally precludes quantitative assessment of the status of most sea-run and resident cutthroat trout populations along the Oregon coast. Occasionally, abundance estimates have been made for resident cutthroat trout in selected headwater streams, but routine population monitoring is not conducted. Incidental information on cutthroat trout densities in some coastal streams has been collected during several research projects by ODFW (Nickelson et al., 1986). However, data collected did not differentiate between the different life-history types. An analy-

sis of data from these studies detected no significant declining trend in central coast populations of cutthroat trout during 1980-1990 (Figures 6 and 7) (T. Nickelson, ODFW, Corvallis, Oregon, personal communication in a memo dated 10-01-91). But these data provide no information about longer-term trends, and it is believed that by 1980, populations may have already been much lower than historic levels due to habitat loss. Counts over Winchester Dam, for example, show that wild populations in the North Umpqua River already had declined to remnant levels well before 1980.

Figure 5. Coastal River Basins in Oregon

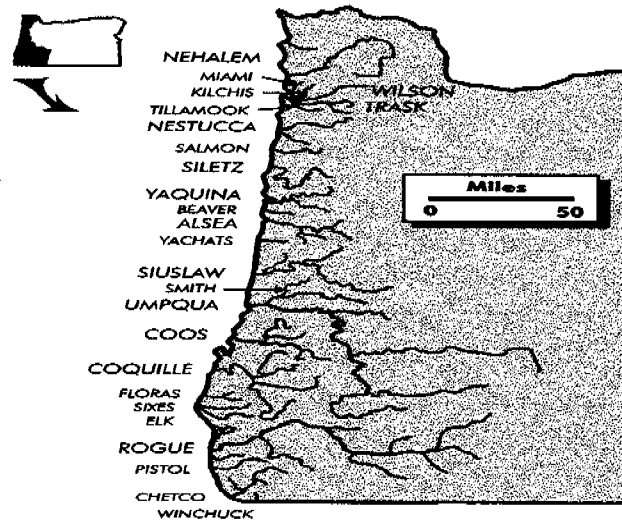
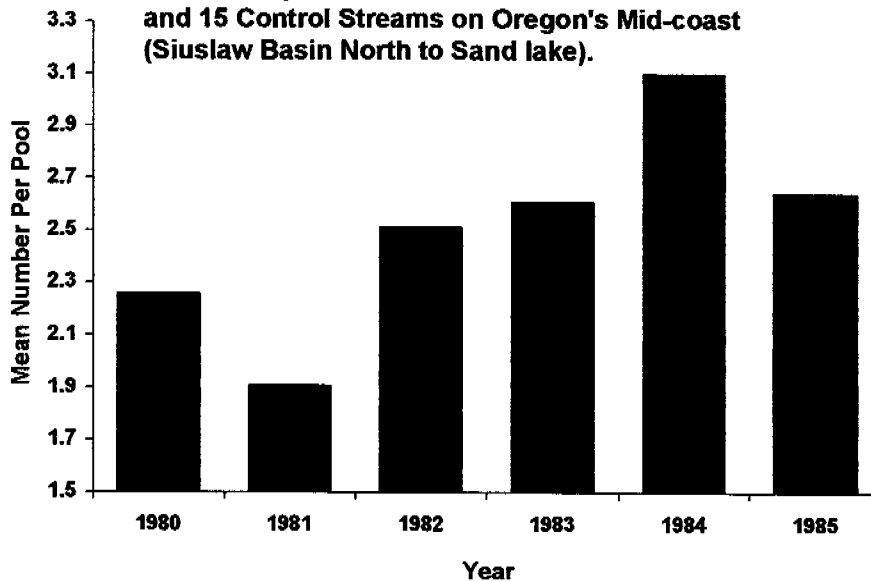
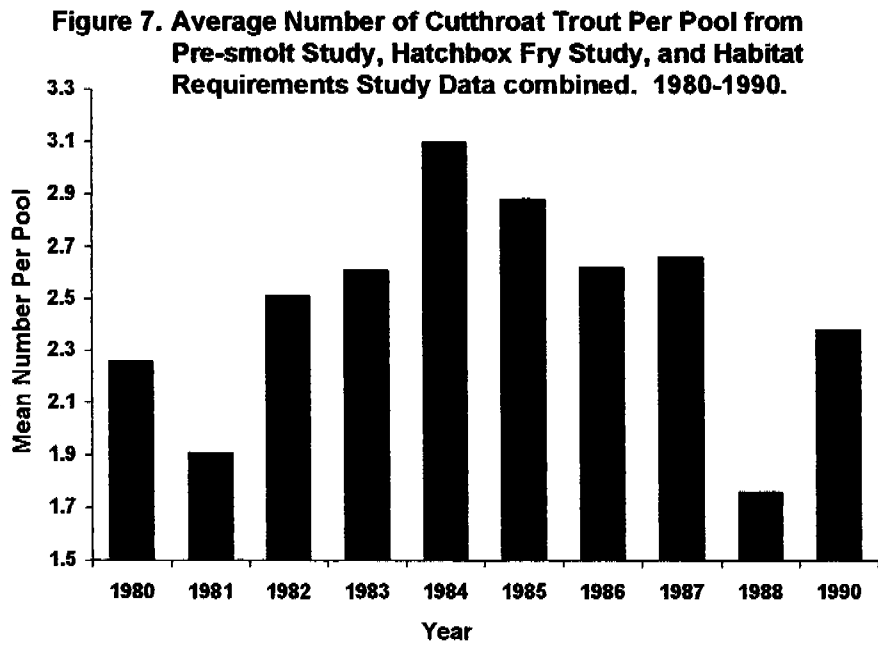


Figure 6. Average Number of Cutthroat Trout Per Pool from Pre-smolt Study data: 1980-1985. 15 Treatment Streams and 15 Control Streams on Oregon's Mid-coast (Siuslaw Basin North to Sand lake).



Summer population estimates of rearing juvenile cutthroat trout in Cummins and Tenmile Creeks have been collected since 1992 as part of the ODFW Salmonid Habitat Research Project. These streams are direct ocean tributaries in the mid-coast region of Oregon. In addition, the number of sea-run cutthroat trout smolts emigrating from each basin is also estimated annually, in an attempt to understand the relationship between the physical habitat in a stream and cutthroat trout populations present. Smolt estimates indicate stable but relatively low numbers emigrating each year (Figure 8). Based on scale analysis and the absence of spawning checks, most 20-25 cm. rearing cutthroat trout sampled (approximately 95%) were anadromous juveniles and were not resident trout (Johnson and Solazzi, 1995). In response to these data, in 1997 ODFW is implementing additional restrictive angling regulations (catch-and-release) to further protect these fish from potential adverse harvest impacts.



Annual counts of fish over Winchester Dam on the North Umpqua River provide the best long-term source of information that we have for any sea-run cutthroat trout population in Oregon (Figure 9). These data indicate a serious decline in that population. From 1946 to 1956, counts of sea-run cutthroat trout over Winchester Dam averaged about 950 adult fish per year and ranged from 400 to 1,800 fish. Anecdotal reports suggest that runs may have been significantly higher prior to this period. By 1960, the wild run over Winchester Dam had declined to fewer than 100 fish. A hatchery program using Alsea broodstock was initiated and boosted the run of cutthroat trout to an average of 940 adult fish through 1976. Hatchery fish comprised the major component of the run throughout the 1961-1976 period. When the stocking of smolts was discontinued, the population size returned to the prestocking size. Wild populations have remained low and have exceeded a total count of 100 fish only twice since 1980. They are now considered near extinction, with a run of 29 fish recorded in 1993, 79 fish in 1995, and 81 fish in 1996. No sea-run cutthroat trout returned to spawn above Winchester Dam in 1992 and 1994.

Figure 8. Number of Sea Run Cutthroat Trout Smolts in Tenmile and Cummins Creeks, 1992-1996.

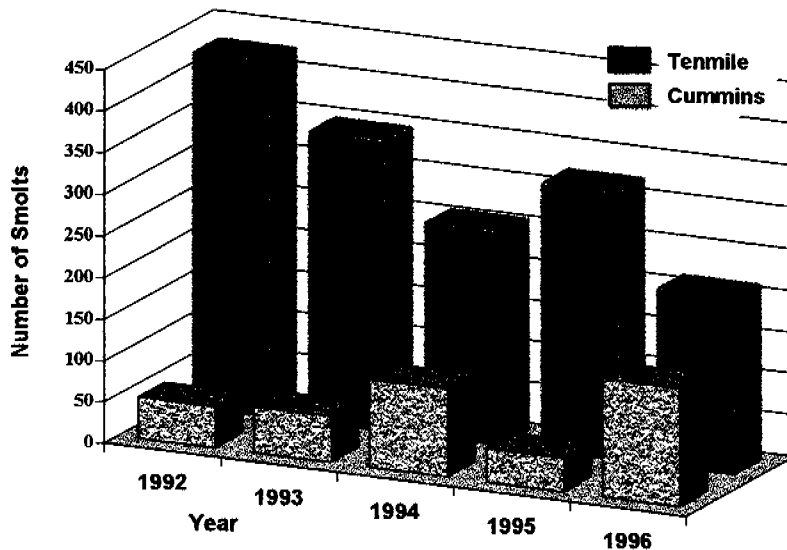
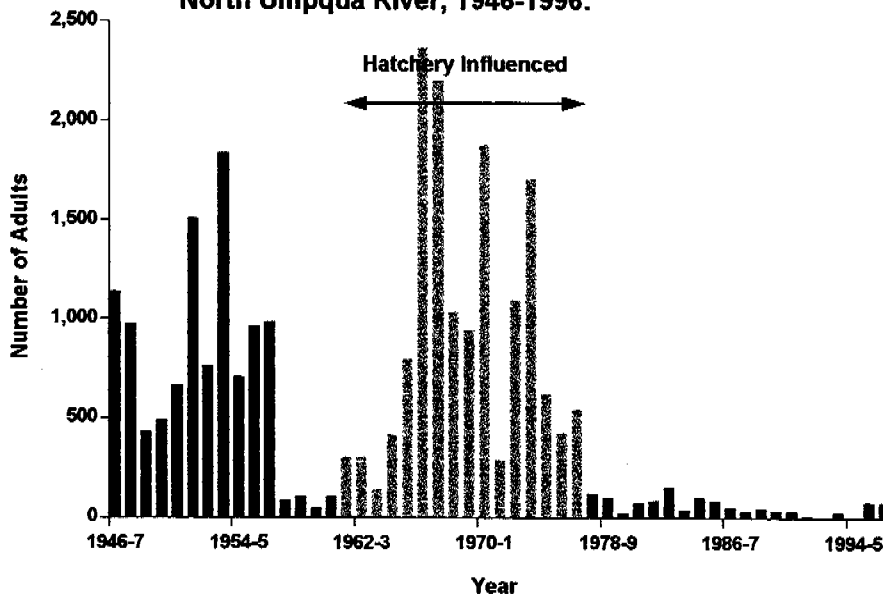


Figure 9. Counts of Sea-Run Cutthroat Trout Winchester Dam, North Umpqua River, 1946-1996.

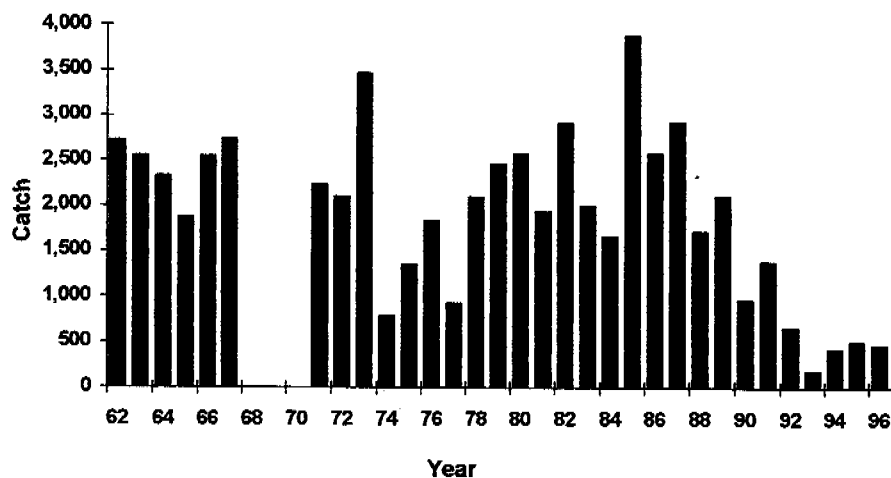


Habitat degradation and associated increases in water temperature in small tributary streams are considered important factors in this decline (Johnson et al., 1994). Genetic effects of introduced hatchery stock from the Alsea River are unknown, but the combination of low population size, in addition to competition and predation by other species, may make recovery difficult. Recovery strategies are also hampered by a lack of basic life-history, genetic, and habitat information. Several studies and surveys are under way to improve the information base in the North Umpqua River. As stated earlier, all trout angling

in stream areas of the Umpqua River Basin where cutthroat trout occur was closed after 1996.

Recent creel surveys in two other coastal river basins, the Alsea and Siuslaw, indicate that a substantial decline in abundance of anadromous cutthroat trout has also occurred in these areas. Catches of anadromous cutthroat trout in the 1990s are less than 10% of catches in the late 1960s in both the Alsea and Siuslaw basins. Volunteer angler catches have been monitored by C&D Marina in Siuslaw Bay for over 30 years (Figure 10). Angler catches peaked in the early 1970s and mid-1980s and have shown a steady decline since 1986, despite increases in the number of hatchery smolts stocked (Figure 11).

Figure 10. Catch of Sea-Run Cutthroat Trout, C&D Marina, Siuslaw Basin, 1962-1996.



Statistical creel surveys were conducted in Siuslaw Bay from 1965 to 1970 (Giger, 1972) and 1992-94. During those periods angler effort for sea-run cutthroat trout declined by about 90%, from about 60,000 angler hours to 6,000 angler hours even though the number of stocked fish has increased (Figure 12). Percentage of hatchery fish returned to angler creels declined 96%, from 31% (1967-1970) to 1.2% (1992-1994).

As numbers of hatchery sea-run cutthroat trout smolts released in the Siuslaw has steadily increased (Figure 11), the percentage of wild cutthroat trout observed in angler creels has steadily declined (Figure 13). Catch of wild sea-run cutthroat trout declined by about 99%, from 5,500 to 68 trout (Figure 14).

Local ODFW biologists strongly believe that due to the nature of the sea-run fishery, abundance of wild sea-run cutthroat trout is strongly correlated to angler effort and catch success. In other words, they believe that abundance of wild cutthroat trout has declined significantly and that this trend is reflected in reduced angler effort, a lower percent return of hatchery fish to angler creels, and dramatically lower catches of wild cutthroat trout. Correspondingly, if wild and hatchery sea-run cutthroat trout were to become more abun-

stant, the fishery would quickly respond with increased effort and increased catches. In addition, this belief is reinforced by our knowledge of reduced survival of coho salmon during this period, as the result of poor upwelling and strong El Niño events. Both coho salmon and sea-run cutthroat trout share the same marine environment during times critical to their survival and would be generally expected to react similarly to nearshore patterns in ocean productivity.

Figure 11. Number of Hatchery Sea-Run Cutthroat Trout Stocked in the Siuslaw Basin, 1947-1996.

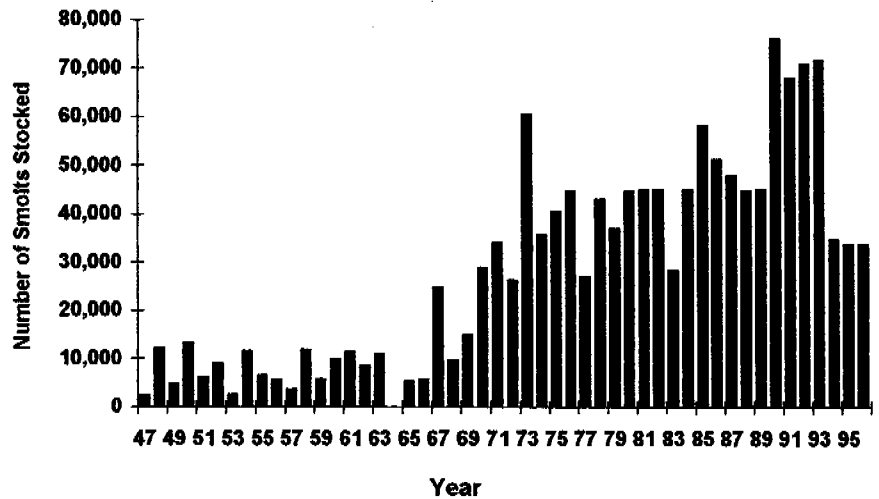
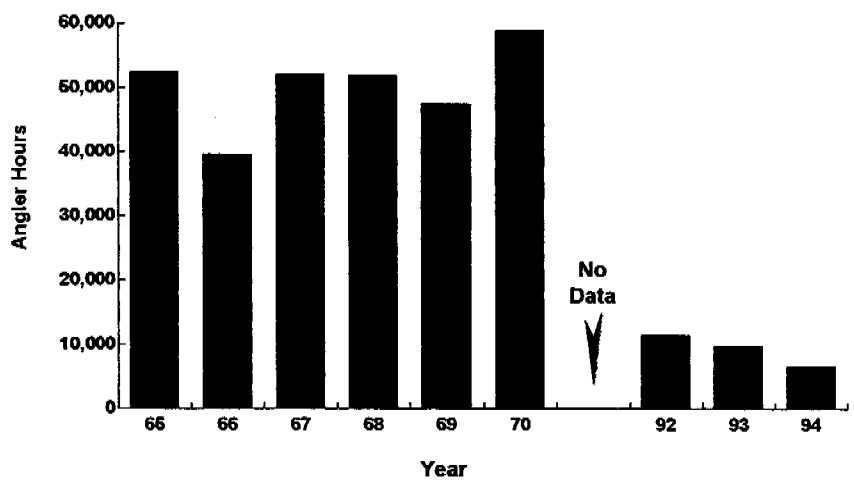


Figure 12. Angling Effort on Sea-Run Cutthroat Trout Siuslaw River, Oregon, 1965-1970; 1992-1994.



Statistical creel surveys were also conducted in Alsea Bay from 1966 to 1970 (Giger, 1972) and 1991 to 1993. During those periods, angler effort for sea-run cutthroat trout

declined by about 93%, from about 46,000 angler hours down to 3,000 angler hours (Figure 15). Catch of wild sea-run cutthroat trout declined about 95%, from 2,600 to 140 (Figure 16). Percentage of hatchery fish returned to angler creels in the sea-run fishery declined 96%, from 50% (1966-1970) to 1.8% (1991-1993). Similar to the Siuslaw River Basin, it is believed that reduced catches of wild cutthroat trout are indicative of a significant decline in abundance of wild sea-run cutthroat trout.

Figure 13. Percent of Wild Cutthroat Trout in the Catch Compared to the Number of Hatchery Cutthroat Trout Stocked, Siuslaw River 1962-1970; 1992-1994.

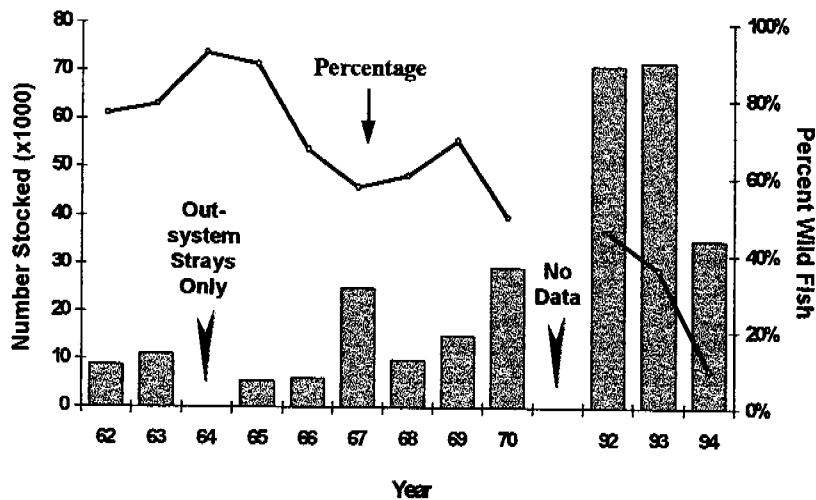
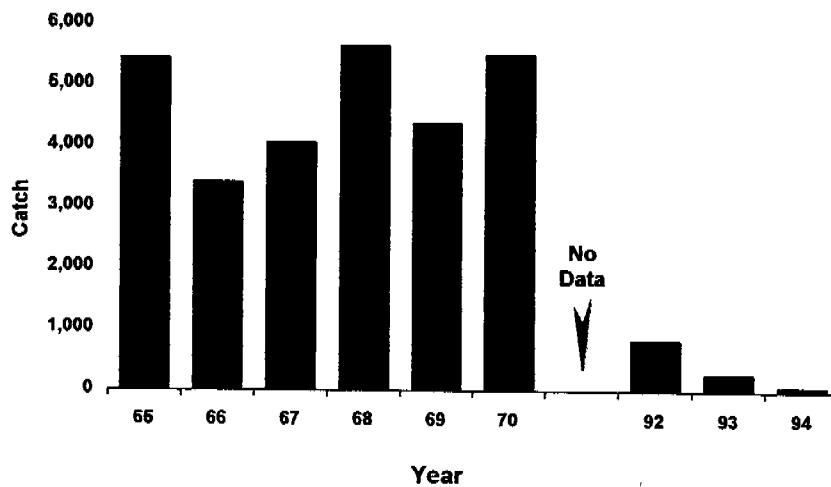


Figure 14. Catch of Wild Sea-Run Cutthroat Trout Siuslaw River, Oregon, 1965-1970; 1992-1994.



Comparable declines however, are not apparent in resident cutthroat populations in these two basins. Although we generally do not have long-term data on resident cutthroat

trout abundance for Oregon coastal streams, field observations in tributaries to the Alsea and Siuslaw rivers do not indicate a dramatic decline, as experienced in sea-run cutthroat trout populations in recent years. As stated earlier, ongoing studies of cutthroat trout distribution indicate that they are widely distributed and multiple age classes are consistently present (Lorenson, et al., 1993; Gregory et al., in press; T. Nickelson, personal communication).

Figure 15. Angling Effort on Sea-Run Cutthroat Trout, Alsea River, Oregon, 1966-1970; 1991-1993.

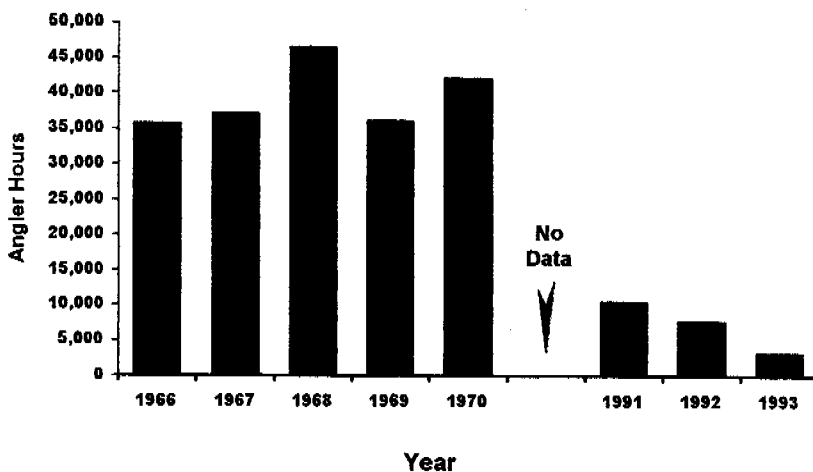
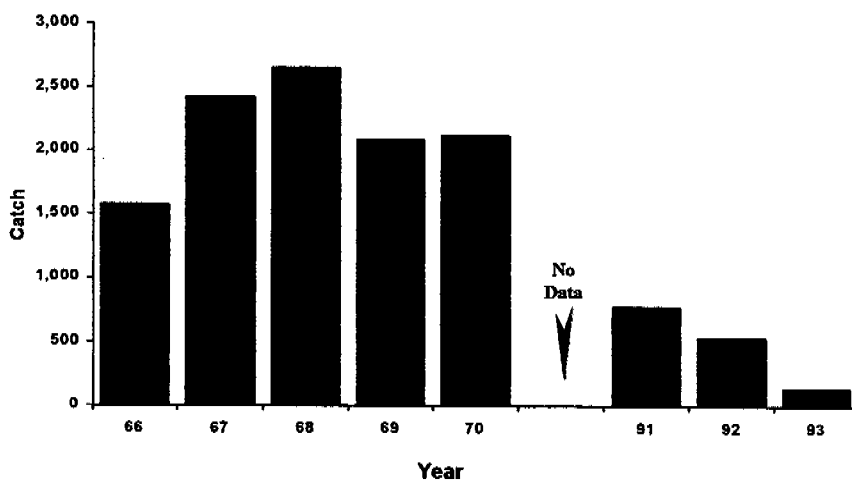


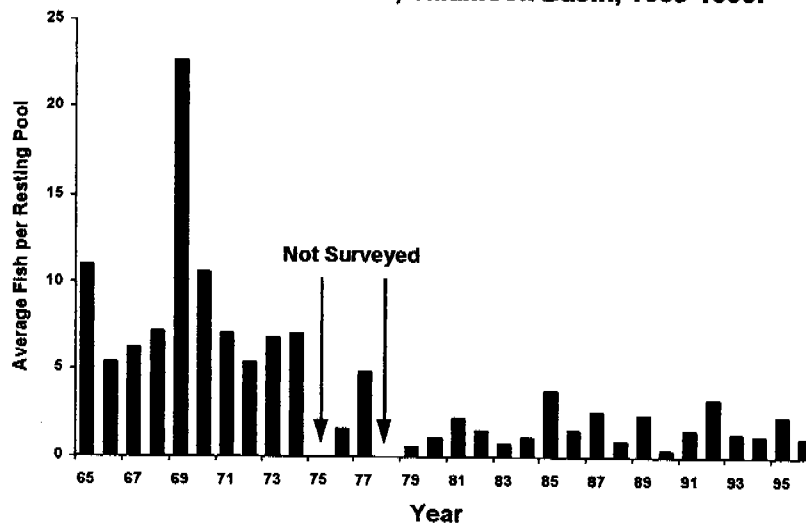
Figure 16. Catch of Wild Sea-Run Cutthroat Trout Alsea River, Oregon, 1966-1970; 1991-1993.



Adult sea-run cutthroat trout returning to the Wilson River have been monitored almost every year since 1965. Surveyors snorkel 12 standard resting pools. During the

period 1965 to 1970 counts averaged 10.5 cutthroat trout per pool. In the period 1990 to 1996 counts averaged 1.7 per pool (Figure 17). This decline in abundance is believed to be similar to declines as observed by reduced angler catches in both the Alsea and Siuslaw basins.

Figure 17. Counts of Cutthroat Trout in Resting Pools, Wilson River, Tillamook Basin, 1965-1996.



Lower Columbia Tributaries

Anadromous cutthroat trout are believed to have been historically present in most lower Columbia River streams in Oregon from the mouth of the Columbia River east to Hood River. It is unknown if streams east of Hood River in Oregon (Chenoweth and Mill creeks) have ever supported sea-run cutthroat trout, although cutthroat trout are present in Fivemile Creek, a tributary in the Fifteenmile Basin (Figure 18).

The abundance of sea-run cutthroat trout in the lower Columbia River basin appears to have also significantly declined in recent years. Although these populations are not routinely monitored, angler surveys conducted in the lower mainstem Columbia during the 1970s observed annual catches of over 10,000 fish. Similar data in the late 1980s estimated the annual catch as low as 500 fish. Catch estimates continued to drop with an all-time low estimated harvest of 69 fish in 1994 (Figure 19). Angling for cutthroat trout continued to be poor in 1995, with an estimated harvest of 110 fish (Melcher, 1996). Since 1994, all wild cutthroat trout caught by anglers in the Columbia River have been required by regulation to be released unharmed.

The effects of long-term hatchery releases of sea-run cutthroat trout on wild stock abundance in lower Columbia River tributaries is unknown. The hatchery broodstock used in most programs was developed from the wild population in Big Creek on the lower Columbia River. Legal-size hatchery releases that were annually made into the Lewis and Clark River (10,000-15,000) were discontinued in 1990, and annual releases into the Klaskanine River (5,000), Big Creek (5,000), Gnat Creek (3,000), and Scappoose Creek

(4,000) were discontinued after 1993. Starting in 1994, remaining lower Columbia River cutthroat trout releases have been switched to standing water bodies.

Most lower Columbia tributaries downstream of the Willamette River are located on privately owned timberlands. The status of resident cutthroat trout in these streams is unknown, but population abundance has probably been diminished due to habitat impacts caused by a variety of land- and water-use activities.

Figure 18. Lower Columbia River Tributaries in Oregon.

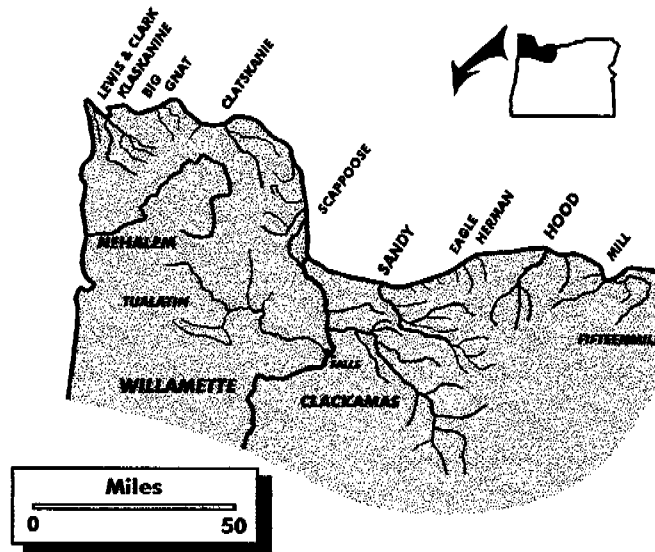
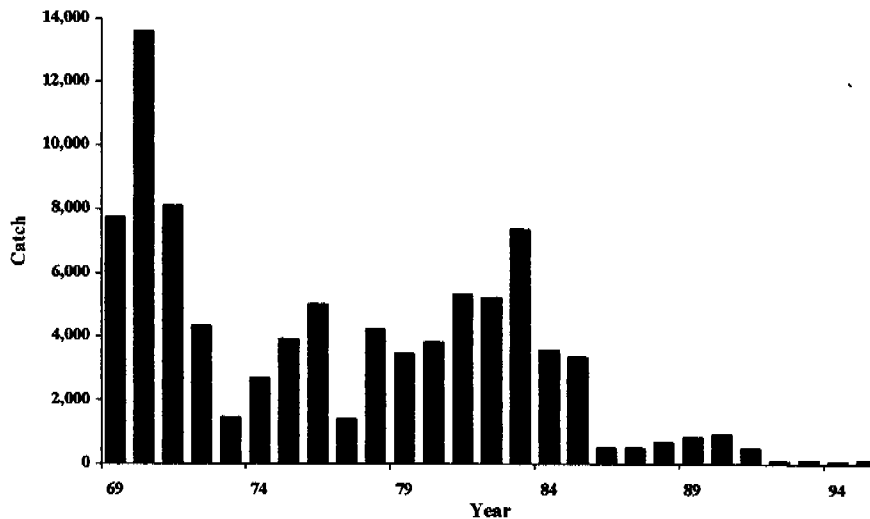


Figure 19. Catch of Sea-Run Cutthroat Trout, Lower Columbia River, 1969-1995.



On the lower Sandy River, 20-30 sea-run cutthroat trout historically entered Sandy Hatchery each fall, but none do now. This general trend of lower cutthroat trout abundance is also reflected in comments from anglers. No large cutthroat trout have been counted upstream past Marmot Dam since counting facilities have been available in 1977, although it would be difficult to distinguish a searun cutthroat trout from jack coho with the video camera used to enumerate fish past the dam (D. Cramer, Portland General Electric, Portland, Oregon, 1995 personal communication). This may be a result of Marmot Dam dewatering an 11-mile reach of the Sandy River below the dam to less than 5 cfs during summer and early fall months between 1913 and 1977. In addition, the ladder at Marmot Dam was usually closed to all fish passage, at least during summer and fall months, from 1913 to 1950 to collect salmon for hatchery broodstock. Beginning in 1997, angling regulations required release of all wild trout in upper mainstem Sandy River (above Brightwood Bridge) and all tributaries. Harvest of wild trout will only be allowed in the lower mainstem Sandy River below Brightwood Bridge, where daily take limits will be reduced from 5 to 2 fish. All hatchery trout releases in streams of the Sandy Basin were terminated after 1994.

The Bull Run River, a major tributary of the Sandy River, probably was a significant producer of sea-run cutthroat trout prior to the construction of the City of Portland water development projects, starting near the turn of the century. Now all migrations are blocked by several large impassable dams. Resident cutthroat trout remain abundant in the tributaries and reservoirs of the Bull Run subbasin as well as in most tributaries of the upper Sandy basin. No public access is allowed to the majority of the Bull Run watershed above dams operated by the City of Portland Water Bureau. This area acts as a significant sanctuary for wild cutthroat trout in the Sandy River basin.

A possibly unique adfluvial population of cutthroat trout is present in Bull Run Lake at the head of the basin. This population is isolated from the rest of the basin by several natural barriers and is also closed to public access.

Columbia Gorge streams such as Latourell, Bridal Veil, Multnomah, Oneonta, Horsetail, McCord, Moffett, Tanner, Eagle, and Herman creeks all historically had small sea-run cutthroat trout runs in the lower reaches below barrier falls (Hess, 1981) but have not been sampled recently. An unknown species of resident trout, possibly either rainbow or cutthroat trout, is present above most of these falls. Sea-run cutthroat trout in Gorge tributaries are not routinely indexed. There is concern about the effects of upstream passage barriers at hatchery diversion dams on Eagle and Tanner creeks.

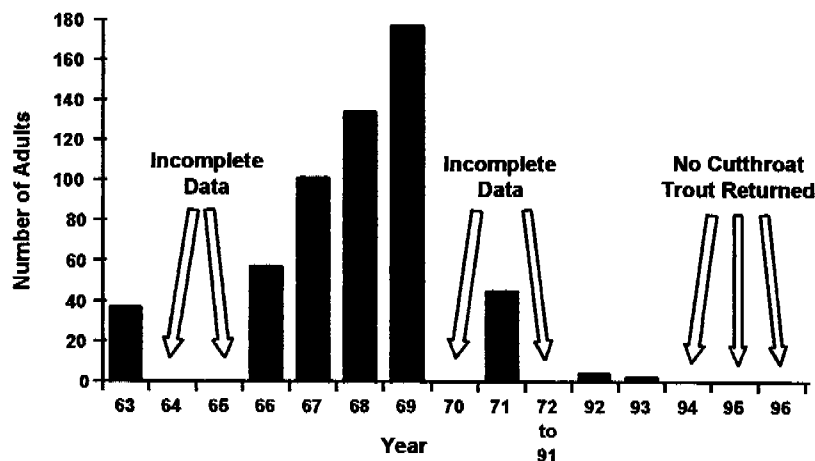
Both resident and anadromous cutthroat trout have been present in the mainstem Hood River and its tributaries, including the East Fork, although no sea-run cutthroat trout have been collected at Powerdale Dam since 1993. Punchbowl Falls, on the West Fork Hood River, may be at least a partial or seasonal barrier to anadromous cutthroat trout migration; since limited sampling above the falls has failed to turn up any cutthroat trout. The Hood River appears to contain some taxonomically unusual trout. The basin is located on the eastern border of both the coastal cutthroat and coastal rainbow subspecies distributions. It may also contain inland redband and westslope cutthroat, and may form a natural hybrid zone between the various subspecies and species (Lambert et al., 1995).

In addition to the cutthroat trout genetics project with NMFS, ODFW is also engaged in a cooperative project with Dr. Fred Allendorf and graduate students at the University of Montana to study the biodiversity of cutthroat trout in mid-Columbia streams near Mount Hood. Currently, genetic samples have been collected from the Sandy, Clackamas, Hood and Fifteenmile drainages, as well as numerous smaller streams in the Columbia River Gorge. Preliminary analysis to date is reported in Lambert, et al. (1995). Project completion is scheduled in 1999.

Hatchery sea-run cutthroat trout (Nehalem, Alsea and Big Creek stocks) were released into Hood River in 1956, from 1974-78 and from 1985-87. The number released ranged from 540 to 33,000 per year. It is unknown how many adults returned from these releases. Likewise, the genetic consequences of these releases on wild stock abundance is also unknown.

Counts of sea-run cutthroat trout past Powerdale Dam were made during 1963-71. Escapement ranged from 17 adults in 1964 to 177 adults in 1969. Based on a similar methodology, estimates of escapement in 1992 and 1993 were 4 and 2 trout, respectively. No sea-run cutthroat trout were captured at the Powerdale trap in 1994, 1995, or 1996 (Figure 20).

Figure 20. Counts of Adult Sea-Run Cutthroat Trout at Powerdale Dam, Hood River, 1963-1972; 1992-1996.



In the Fifteenmile Creek drainage, cutthroat trout are known to be present in Fivemile Creek and are suspected to be present in Eightmile Creek. Cutthroat trout abundance and distribution, and their relationship with the rainbow trout and steelhead that are also present in the basin, are not known.

Willamette Basin

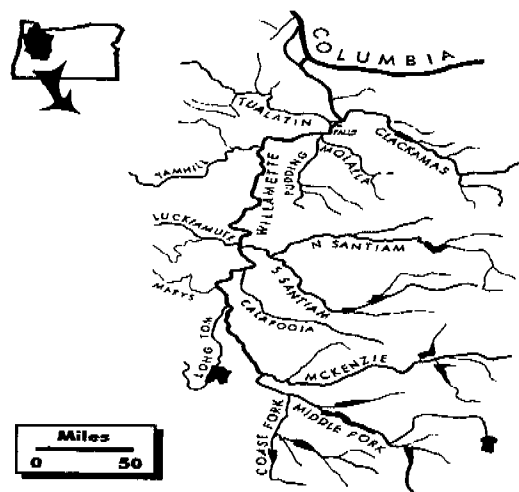
Only tributaries of the lower Willamette River below Willamette Falls have sea-run cutthroat trout (Moring and Hooton, 1978). In both the Sandy and lower Clackamas rivers,

sea-run cutthroat trout are believed to have been much more abundant historically than they are today. Their historic upstream distribution in the lower Clackamas River is not known, but Cazadero Dam near the City of Estacada blocked all upstream passage during the period 1917-1939. No sea-run cutthroat trout have passed North Fork Dam since 1958 when counts were first initiated (D. Cramer, Portland General Electric, Portland, Oregon, 1995 Personal Communication). Besides passage barriers and impacts to spawning and rearing habitat, a factor that may have led to the decline of sea-run cutthroat was the adverse effect of competition with releases of thousands of presmolt coho salmon into tributaries of the lower Clackamas River during the late 1970s and early 1980s. This practice has been discontinued for over a decade. Lower Clackamas tributaries Deep, Clear, and Eagle creeks are the suspected spawning areas of the remaining run.

Resident cutthroat trout are abundant and well distributed throughout headwater and lower Clackamas River tributaries. Although there is some overlap in distribution among resident cutthroat trout, resident rainbow trout, and juvenile steelhead, cutthroat trout predominate in steep, first-order tributaries (USFS 1995).

Fluvial, adfluvial and resident life-history types of cutthroat trout are present throughout the Willamette River mainstem and tributaries above Willamette Falls (Figure 21). Cutthroat trout are the only native trout present in Coast Range tributaries to the Willamette River such as the Tualatin, Yamhill, Rickreall, Luckiamute, Marys, and Long Tom rivers (Moring and Youker, 1979). Although brook trout have been historically released into these streams, and hatchery rainbow trout are still released into Yamhill, Rickreall and Luckiamute rivers, only cutthroat trout persist through natural production.

Figure 21. Willamette River Basin.



The general pattern for these Coast Range tributaries to the Willamette River is for fluvial cutthroat trout to be present in the lower mainstems of each stream. These areas are used for feeding and spawning migrations during fall, winter, and spring months.

Resident cutthroat trout are dominant in headwater areas, occasionally isolated by barriers (Nicholas, 1978). The transition zone between the two life-history types below barriers is not well understood. The amount of gene flow between streams such as the Tualatin and Yamhill is unknown, but movement between basins is probably restricted to winter months. Warm water temperatures in the mainstem Willamette River and the presence of the parasite *Ceratomyxa shasta*, to which Willamette cutthroat are susceptible (based on studies conducted by ODFW staff), likely limit interstream movement of cutthroat trout during summer months (S. Mamoyac, ODFW, personal communication).

A unique adfluvial cutthroat trout population has developed on the upper Long Tom River since the construction of Fern Ridge Dam in 1941. The population was historically fluvial prior to dam construction, but now makes spawning runs upstream out of Fern Ridge Reservoir during late summer each year. When caught by anglers upstream near the town of Noti, these fish are large, often greater than 30 cm. in length, with a silver coloration similar to sea-run cutthroat trout. Cutthroat trout that remain resident in the upper Long Tom River seldom exceed 20 cm. total length and appear "coppery" in coloration. Historically, fluvial cutthroat trout in tributaries of the lower Long Tom below Fern Ridge Dam have had their migrations to the Willamette River blocked above the town of Monroe, by additional impassable irrigation dams, which were also constructed by the Corps of Engineers at the same time as Fern Ridge Dam (Moring and Hooton, 1978).

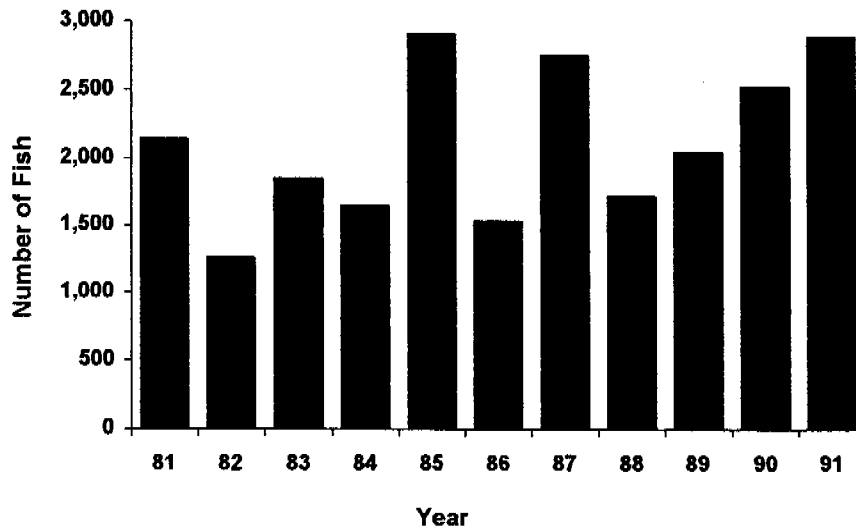
Even though only a few fluvial cutthroat trout populations have been systematically monitored in recent years (Long Tom and Marys systems), we believe that cutthroat trout in westside tributaries to the Willamette River are generally declining in abundance. This belief is largely based on the ongoing pattern of habitat loss and degradation as a result of agricultural and urban development in the Willamette Valley. In order to further protect these fish, angling regulations have been in effect since 1994 that require release of all wild trout in the mainstem Willamette River from confluence with McKenzie River downstream to the town of Harrisburg.

Fluvial cutthroat trout in eastside tributaries of the Willamette Basin are largely restricted to the McKenzie River system. Headwater tributaries of the Molalla, Santiam and Calapooia river systems have abundant resident cutthroat trout present, but the lower reaches of these streams are dominated by juvenile steelhead and resident rainbow trout. An exception is Crabtree Creek, which still likely contributes fluvial cutthroat trout to the lower South and mainstem Santiam rivers. Past electrofishing surveys have estimated 88 and 61 fluvial cutthroat trout per km in the mainstem Santiam in 1976 and 1977, respectively (Moring, 1977).

Isolated populations of cutthroat trout are known to occur above natural barriers on all eastside tributaries to the Willamette River. Occasionally abundance estimates have been made for selected cutthroat trout streams, but routine population monitoring is not conducted. As examples, the Blowout Creek system (North Santiam River) averaged 2,264 cutthroat trout per km (all age classes) in 1980; Packers Gulch Creek (S. Santiam River) averaged 1,726 cutthroat trout per km (all age classes) in 1982 (Hunt, 1982; Wetherbee and Hunt, 1982).

Population estimates have been made for an isolated population of cutthroat trout in a 1.6 kilometer reach of Dead Horse Canyon Creek in the Molalla basin, during 1981-91 (House, 1995). This stream received very little angling pressure in the past. Since 1987 public access has been closed by the landowner. Population abundance of age 1 and older cutthroat trout has fluctuated annually, but has been relatively stable over time, averaging 1,357 trout per kilometer (Figure 22).

Figure 22. Age 1 and 2+ Cutthroat Trout Population Abundance in a 1.6 Kilometer Reach of Dead Horse Canyon Cr., Molalla Subbasin, 1981- 91. (Adapted from House 1995)



Wild adfluvial cutthroat trout populations are present in Cascade Mountain lakes in the Clackamas, Santiam, McKenzie and Middle Fork Willamette River subbasins. Populations in Donaca, Pamela, Moose, Gordon, Bingham, Elk, Fish, Hidden, and Windfall lakes have apparently not been impacted by introduced trout. Populations in Marion, Lava, Whitewater, Riggs, Clear, Nash, and Middle and Lower Horse lakes have been impacted by competitive interactions with introduced brook and rainbow trout (W. Hunt, ODFW, and J. Ziller, ODFW, 1995 personal communications).

In the lower McKenzie River, fluvial cutthroat trout dominate trout populations up to approximately Rkm 28. Mohawk River and Camp Creek tributaries provide abundant spawning and early rearing areas for these cutthroat trout (Moring and Youker, 1979). In this lower gradient section of the main McKenzie River, cutthroat trout apparently have a competitive advantage over rainbow trout. Abundance estimates of cutthroat trout in the lower 18 kilometers of the McKenzie River during 1988, 1989, 1991 and 1994 show an increasing trend. Estimates ranged from 188 to 564 cutthroat trout greater than 20 cm in length per km of shoreline sampled (J. Ziller, ODFW, 1995, personal communication). Catch-and-release angling regulations have been in effect on this reach of river since 1990. No hatchery trout are released into this reach of river.

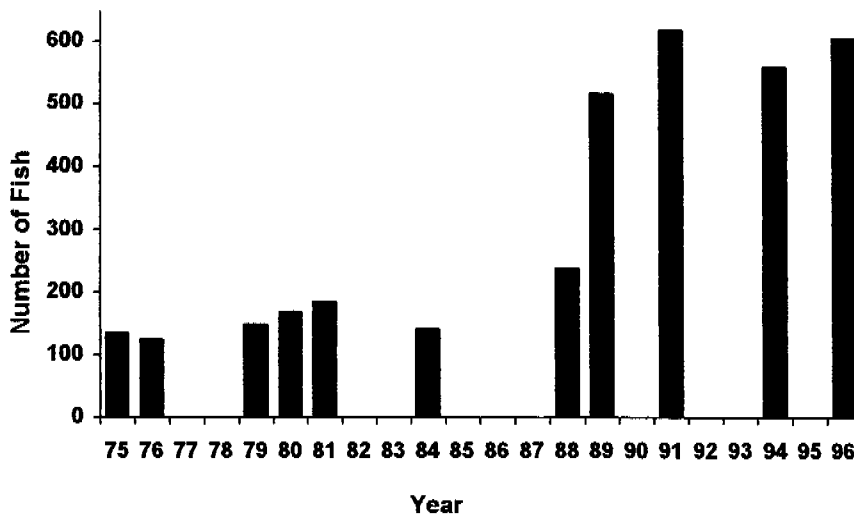
Downstream migrant trapping of juvenile cutthroat trout was initiated by ODFW on the Mohawk system in 1993. Analyses of mark-recapture estimates indicate that the Mohawk

River produced a significant number of outmigrant cutthroat trout (approximately 10,000 juveniles based on the volume of water sampled) and may be the primary production area for cutthroat trout in the McKenzie and mainstem Willamette rivers downstream to Harrisburg.

In the remainder of the McKenzie system and throughout the Middle Fork Willamette River drainage, cutthroat trout are relegated to small tributary streams and headwater areas. These streams are principally on private and National Forest timberlands. Trends in cutthroat trout abundance are not routinely monitored for the majority of these areas, but considerable road building, timber harvest and in-channel modifications of fish habitat has occurred in the past and have probably affected abundance.

One area that is routinely monitored in the upper Willamette River basin is the North Fork of the Middle Fork Willamette River. Cutthroat and rainbow trout numbers in this river have been relatively stable since the mid 1970s in 20 standard index pools surveyed by snorkeling (Nicholas, 1977). During 1975-1996, these pools averaged 313 rainbow and cutthroat trout between 15 and 31 cm (Figure 23).

Figure 23. Counts of 15-31 cm. Cutthroat and Rainbow Trout in 20 Standard Pools in N. Fork Willamette River. 1975-1996.



The only cutthroat trout stocking in the Willamette system occurs in Cascade mountain lakes on the eastern border of the basin. Both Twin Lakes cutthroat (a broodstock developed from a westslope cutthroat trout population in eastern Washington) and Hackleman cutthroat trout (a broodstock developed from a coastal cutthroat population native to the upper McKenzie drainage) are stocked. At lakes with outlets, the effects of this stocking on downstream cutthroat trout populations are unknown. A sampling design for a genetic survey of Willamette cutthroat trout is in place and will be implemented when funding becomes available. Samples were collected from Hackleman Creek in the upper McKenzie basin, in the lower Luckiamute basin in 1992, and from Pamela Lake in the North Santiam basin in 1996. Results of this work will be included in NMFS coastwide

status review of sea-run cutthroat trout under the ESA (K. Kostow, ODFW, Portland, 1996 personal communication).

Conclusions

Resident coastal cutthroat trout are widespread in western Oregon and are believed to be the dominant trout in most headwater tributaries. Multiple age classes are consistently present in hundreds of independent populations in western Oregon. Populations appear to be stable and secure, but likely lower in abundance than historic levels due to habitat loss. Influence of hatchery trout has historically been minimal and there is none at present. Angler use is generally light due to the small average size of these trout and the streams they inhabit. Natural mortality as a result of habitat limitations is likely limiting individual population abundance.

Fluvial cutthroat trout are likely present in most larger river systems in western Oregon. Although not routinely monitored in most streams, data available indicate a mixture of healthy populations and others of unknown status. Most fluvial populations have been exposed to hatchery trout releases (either rainbow or cutthroat trout) at one time or another, and are easily accessible to angling. All hatchery trout releases, which may have historically influenced these populations, have been systematically reduced in the past decade, with no releases scheduled after 1996 in coastal and lower Columbia River streams. It is unknown to what extent angling harvest is limiting population abundance. Catch-and-release regulations or angling closures have been enacted on a variety of fluvial populations throughout western Oregon to further protect against potential angling-related effects.

Adfluvial cutthroat trout are present in a variety of geologic settings above and below barriers to anadromous fish. Data available indicate a mixture of healthy populations and others of unknown status. Most populations isolated above barriers to anadromous fish have not been exposed to releases of hatchery trout and are lightly fished. These populations are likely healthy due to low angler use and stable habitat. Many adfluvial populations accessible to anadromous fish have been exposed to releases of hatchery trout and correspondingly are more heavily fished upon. These populations are not routinely monitored, and their status is unknown.

Anadromous cutthroat trout are believed to be present in most coastal and lower Columbia River streams that do not have upstream passage barriers in lower reaches. Data from dam counts and angler creel surveys on mid and north coast and lower Columbia streams indicate that anadromous cutthroat trout have likely undergone a significant decline in the past decade. Potential causative factors include: a significant decline in nearshore productivity since the mid-1970s, genetic and fishery consequences of widespread use of hatchery sea-run cutthroat throughout Oregon coastal and lower Columbia River streams, and reduction of stream and estuary habitat complexity due to land- and water-use activities. Conservation measures in place include termination of hatchery trout stocking in all coastal and lower Columbia River streams with sea-run cutthroat trout,

catch-and-release trout angling regulations in all coastal streams, habitat projects that benefit cutthroat trout, and intensified population monitoring.

ESA Listing Status

Coastal cutthroat trout are listed by the state of Oregon as "sensitive" for anadromous populations in the lower Columbia River, and for all populations in the Umpqua River Basin below natural barriers. The NMFS proposed in July 1994 that all cutthroat trout populations in the Umpqua River Basin be listed as an endangered species under the federal ESA. On August 9, 1996, NMFS published final rules of an endangered listing for all populations of resident, fluvial, and anadromous cutthroat trout in the Umpqua River basin below natural barriers.

Actions Under Way

Management objectives for cutthroat trout have been adopted by the Oregon Fish and Wildlife Commission in the Willamette, Yaquina, Tenmile and Coos river basins. Draft management plans are in progress in the Rogue, Coquille, Umpqua, Siuslaw, Alsea, Salmon, Nehalem, Sandy, Hood, and Fifteenmile river basins. Genetic samples of cutthroat trout have been collected and are being analyzed for the Hood, Fifteenmile, Sandy, Upper Willamette, Coquille, Elk, Umpqua and several other coastal basins in a cooperative project with NMFS.

Annual population monitoring is in progress on the Hood River at Powerdale Dam, in Willamette basin tributaries including the Mohawk, McKenzie, North Fork Willamette, Long Tom and Marys rivers, on the North Umpqua River at Winchester Dam, and on the Rogue River at Elk Creek Dam. Native cutthroat trout broodstocks for the Cascade Mountain Lakes Stocking Program are being developed from Hackleman Creek and Pamela Lake stocks. Testing for resistance to *C. shasta* has been conducted on several Willamette basin stocks and further testing is proposed on additional stocks. Life-history studies of North Umpqua cutthroat trout have been in place for the last several years and are continuing in consultation with NMFS. As of 1994, stocking of hatchery sea-run cutthroat trout has been discontinued in all lower Columbia River tributaries, mainstem and North Fork Nehalem River, Tillamook Bay tributaries, Nestucca River, Scholfield Creek and Smith River (Umpqua). The remainder of the sea-run cutthroat trout stocking programs in coastal streams (Siuslaw, Alsea, and Salmon rivers) have been discontinued after 1996. Catch and fishing effort on wild and hatchery sea-run cutthroat trout have been recently documented in statistical creel surveys on the Siuslaw, Alsea, and Lower Columbia rivers. Catch and release regulations for all trout angling in coastal streams with sea-run cutthroat trout is in effect starting in 1997.

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