9.0 Fish and Fish Habitat

The purpose of the fish and fish habitat section was to compile available information on fish populations, in-stream habitat, and migration barriers in the watershed in order to evaluate potential impacts to important areas of current fish use and habitat. Salmon depend on clean, cool water, in-stream structural complexity, and unobstructed passageways for spawning, rearing and overwintering habitat. The complex life cycles of the various salmonid species depend on a variety of stream habitat types. The Nehalem River and tributaries provide habitat for spring and fall chinook, coho salmon, chum salmon, steelhead trout, and sea-run cutthroat trout.

Methodology

This majority of this section was completed by synthesizing available information from a variety of sources. For the habitat condition evaluation, ODFW surveys were used for the streams which have been surveyed recently (since 1993). Individual parameters for pools, riffles, riparian species and large woody debris were identified as either desirable or undesirable according to ODFW benchmarks.

Salmonid Populations

The Nehalem watershed is known to support many species of fish. There are a few exotic species, which are confined to limited areas. Non-salmonid anadromous fish such as pacific lamprey and western brook lamprey are present. Resident cutthroat trout, rainbow trout, sculpins and largescale suckers are common resident fish found throughout the basin.

Anadromous salmonid species known to occur are summer and fall chinook (*oncorhycnchus tshawytscha)*, coho salmon (*O. kisutch)*, chum salmon (*O. keta)*, steelhead trout (*O. mykiss)*, and sea-run cutthroat trout (*O. clarki)*.

Information which can provide a means of assessing the present status and trends of anadromous salmon populations include threatened or endangered listing, fish presence and distribution, population status, stocking history, life history patterns, important habitat areas, know migration barriers, and species interactions. Table 9-1 shows the generalized findings pertaining to each salmonid species. The rationale for the information contained in the table follows as it pertains to each species in the Nehalem Watershed.

Winter Steelhead

Wild winter steelhead are present in much of the Nehalem Drainage including most of the major tributaries and the mainstem (See Figure 9-1). The strongest population exists in the Salmonberry drainage up to the falls. This population represents one of the five healthiest wild winter steelhead populations in the state of Oregon (Huntington et al, 1994). ODFW spawning ground and juvenile surveys indicate that this population has been relatively abundant since 1980. The population has been managed only for wild fish and has had little influence from hatchery programs. A rainbow trout population in the North Fork Salmonberry River is isolated between two waterfall barriers. This population is located on private timberland and is threatened by future timber harvest activity (Kostow, 1995). In other areas of the Nehalem River drainage, steelhead populations are not as secure because of either low numbers of steelhead and/or relative of abundance of hatchery fish.

Figure 9-1

Figure 9-1

Table 9-1

Table 9-2

The National Marine Fisheries Service (NMFS) has put winter steelhead on the Candidate Species List under the Endangered Species Act. For the list, NMFS identifies species as candidates for possible addition to the List of Endangered and Threatened Species. The list is not a proposal for listing, but serves to notify the public that NMFS has concerns that may warrant listing the species in the future (Federal Register, July 14, 1997). The intent is to encourage voluntary conservation efforts.

Adult winter steelhead enter streams on their spawning migration upstream most abundantly December through March in the Nehalem Drainage. Steelhead usually push further upstream than either chinook or coho in search of spawning beds. The peak spawning period for wild steelhead ranges from late February to early May, with most streams peaking in March or April (ODFW, 1993). Spawning has been identified on the Salmonberry River through May into June. Steelhead can spawn more than once. Fry emerge from the gravel during the summer, mostly in mid-August. Nearly all juveniles in the Nehalem basin spend 2 full summers and winters in the freshwater streams from which they emerged before emigrating to the ocean during the spring of their second year.

Steelhead use a variety of habitat types during their rearing period. Ideally, fry emerge from clean, pea to orange-size spawning gravel in cool water. Young steelhead (<1 yr) are generally most abundant in protected areas within riffle type habitat (ODFW, 1993). Juveniles (>1 yr) prefer higher velocity areas at the head or tailouts of pools or in rapids and are usually associated with cover provided by boulders or large woody material.

Critical habitat areas for winter steelhead include the Salmonberry River and tributaries, Cook Creek, Rock Creek, Wolf Creek, West Humbug Creek, and some reaches of the mainstem Nehalem River above Lousignont Creek (See Figure 9-1).

The main purpose of all the steelhead production at the Nehalem Hatchery (located on the North Fork Nehalem River) is to provide steelhead for recreational fisheries. Irregular winter steelhead hatchery releases were made from the Foley Creek hatchery from 1926 through 1964. About 900,000 fry and about 24,000 smolts were released into Foley Creek (ODFW, 1993). Additionally, small releases were made on the Salmonberry River in 1959, the upper mainstem in 1961. About 15,000 summer steelhead smolts were released in the Salmonberry in 1960 and 1961. The summer steelhead probably did not survive due to non-resistance to a parasite called *Ceratomyxa shasta*, which is prevalent in the Nehalem Drainage. Wild salmon have evolved more resistance to the parasite, although increased incidence of the disease was noted by Weber (1977) with high stream temperatures.

Winter steelhead have consistently been released into the Nehalem Drainage since 1964. Stock from the Alsea Hatchery was unsuccessful due to non-resistance to *C. Shasta*. Stocks from the Big Creek Hatchery were released in the North Fork Nehalem and eventually, Fishhawk Lake Creek wild steelhead were used to develop a secondary hatchery stock in the early 1980's. Both strains of hatchery steelhead have been released into both the mainstem and North Fork

Nehalem River. Catches by fisherman are greater on the North Fork, which is attributed to the smaller size of the North Fork compared to the mainstem due to high flows and turbid conditions (ODFW, 1993).

Coho Salmon

Coho salmon are present throughout much of the drainage. All major tributaries are used by coho for spawning and rearing. The mainstem Nehalem River is used primarily for rearing of juveniles and migration to smaller streams (ODFW, 1996). Surveys have shown a genetically distinct group in the Nehalem basin (Kostow, 1995) which is interspersed with coho that show similarities with some of the populations immediately to the south.

The NMFS made the decision to list Oregon Coast populations of coho salmon as threatened under the Endangered Species Act (ESA) on August 10, 1998. The ESA (section 3) defines a threatened species as any species which is likely to become an endangered species (in danger of extinction) within the foreseeable future throughout all or a significant portion of its range. The coho population for the Oregon Coast is estimated to be 5 to 10% of historic abundance levels (Weitkamp et al., 1995).

Historically, coho were the most abundant species in the Nehalem Drainage. Fisheries catch during the 1920's and 1930's show an average of over 50,000 coho caught annually from the Nehalem drainage (ODFW, 1993). A severe decline has occurred since 1950. Surveys show that wild coho are either extirpated or extremely depressed on the lower mainstem. The mid and upper reaches of the drainage still contain wild coho in most areas, but are severely depressed. According to ODFW (1993), better habitat for coho exists in the mid and upper reaches of the drainage. These coho have a high level of conservation significance. The wild coho populations to the north and south of the watershed are in worse condition than the populations in the mid and upper Nehalem River. The populations in the Tillamook Bay streams are very close to extinction and only slightly better in the Nestucca River drainage (Weitkamp et al., 1995).

Coho salmon have a fairly straightforward life history. Mature fish migrate into freshwater in the fall, and typically spawn from November through February. They spend several weeks to several months in freshwater before spawning. All adults die within two weeks after spawning. Most juveniles spend one year in freshwater before migrating to ocean in the spring. They will spend about 1 1/2 years in the ocean and return as three year old adults.

Juvenile coho require low gradient streams with extensive instream structure for protection during winter high stream flows. Coho will overwinter in lakes or off-channel alcoves and beaver ponds where available. Shaded streams with tree-lined banks is preferred for rearing. Streams which provide important habitat include Upper Rock Creek, Wolf Creek, East Fork Nehalem River, Northrup Creek, and Beneke Creek (See Figure 9-2). The lower Nehalem has little good coho habitat due to stream gradient (Salmonberry, Cook Creek). According to ODFW (1993), Foley Creek has potential for rehabilitation.

Figure 9-2

Figure 9-2

Habitat loss is blamed for much of the coho salmon decline (Kostow, 1995). The natural occurrence of large woody debris has declined due logging and the loss of conifers from riparian areas, which would have provided long-lasting instream structure when they fell into streams. Sediment from logging roads, road failures, loss of ground cover, along with reduction of water filtering and shade due to removal of riparian vegetation, has reduced egg and juvenile survival. Also, historically, log drives stripped spawning gravel and logs from the river bottoms.

The primary goal for production of hatchery coho is contribution to ocean fisheries spread along the Oregon coast. Catches from rivers has historically been low compared to ocean harvest. The mainstem Nehalem was closed to all angling for coho salmon starting in 1992 and angling is prohibited on all streams since the ESA listing. Historically, coho releases made using stock from the Trask and Alsea Rivers were unsuccessful due to absence of *C. shasta* resistance. Since that time, coho from the Fishhawk Lake system and Foley Creek have been used. Coho releases represent 60% of the annual fish production at the Nehalem hatchery. Between 800,000 and 900,000 coho smolts are released each year (ODFW, 1993). The survival of Nehalem Hatchery coho has averaged between two and three percent over the years.

Hatchery production of coho may have contributed to the decline of wild coho salmon. Historic rates of release were excessive for sustained wild fish production (Kostow, 1995). Average percent of hatchery fish on spawning grounds in the Nehalem Basin for the period 1989-1991 was estimated as 66% (Weitkamp et al., 1995). Hatchery coho increased competition for food and shelter. Hatchery fish have strayed and spawned with wild coho, which has resulted in genetically less fit wild populations, including less resistance to disease. Currently, less coho mix with wild populations, due to improved hatchery management practices, however interbreeding may still occur on the North Fork Nehalem River due to the close proximity of wild coho populations to the hatchery release site.

Chum Salmon

Chum salmon typically use only the lowest reaches of the Nehalem Basin (See Figure 9-3). ODFW surveys show that chum salmon use the lower reaches of the North Fork Nehalem River and Foley Creek for migration and rearing. The tributaries of these streams are used by chum for spawning and rearing. ODFW surveys identified spawning in Foley, Bob's, Coal, Boykin, Henderson, Big Rackheap, and Soapstone Creeks. Foley and Bob's Creek appear to hold the largest populations, which consists of several hundred adults.

NMFS presently holds the opinion that any ESA listing for chum is not warranted at this time (ODFW, 1999).

Chum salmon were extensively caught by gill net fisheries until 1957. They have not recovered from the low levels of the 1950's. The reason is not clear. Chum have been taken incidentally in river and ocean fisheries for coho. Also, juvenile coho can be a major predator on chum juveniles. Large scale hatchery releases of coho have been made since the 1960s into the North Fork Nehalem River which may be increasing predation in chum rearing areas. Poor ocean productivity conditions since the late 1970's has probably contributed to low recovery rates as well as the degradation of habitat in the lower basin due to urbanization and barriers. Unlike coho and chinook, chum salmon are not leapers. Stream barriers, which do not pose problems for other species, can be impossible barriers for chum.

Chum typically ripen and spawn very quickly after leaving the ocean. Spawning usually peaks during November and early December. Chum in the Nehalem basin generally spawn at three to four years old. After fry emerge from spawning gravel, they typically move promptly downstream to the estuary where they linger for about a week before moving on to ocean waters.

Oregon has never had a large chum salmon hatchery program. There are no state hatchery programs presently. There was a private hatchery operating in the Nehalem estuary from 1981 through 1993. The chum salmon used in this program originated from Netarts Bay. Annual releases ranged from 92,000 to 1,581,000 juveniles. A limit of 900,000 juveniles was set for release in 1993. The returning adults never comprised more than 1% of the released quantities. The hatchery management has tried to catch all returning hatchery adults, but some straying has occurred (Kostow, 1995).

Chinook Salmon

There is one wild run of summer chinook in the Nehalem Basin which is genetically different than the more abundant fall chinook. Summer chinook spawn in a few suitable gravel bars in the mainstem between river miles 41 and 101. Humbug and Rock Creeks are the only known tributaries to support summer chinook (See Figure 9-4).

A healthy stock of fall chinook are found in the larger tributaries of the lower half of the basin (See Figure 9-5). The largest runs in the mainstem occur in Humbug Creek, the Salmonberry River, Cook Creek, and Lost Creek. The North Fork gets large runs in Soapstone Creek, God’s Valley Creek and the upper reaches of the North Fork.

According to Kostow (1995), cannery records indicate that 5,000 to 18,000 chinook were caught annually in the basin between the 1890’s and 1940’s. Chinook population size probably hit a low in the 1940’s and early 1950’s. Adult spawners gradually increased until reaching peak numbers between 1975 and 1985. There has been a gradual decline since that time to a current estimate of 1,000 to 3,000 fall chinook annually. Summer chinook population has exceeded 300 fish each year.

NMFS has determined that a chinook listing under the ESA is not warranted at this time. A large panel of NMFS scientists concluded that the long-term trends in abundance of chinook are upward and that chinook are neither presently in danger of extinction nor are likely to become so in the foreseeable future on the Oregon Coast (BRT, 1997). Chinook seem to be well distributed among numerous basins along the coast.

Summer and fall Chinook differ in distribution, migration timing, and spawning timing. Summer chinook enter the river system in May through July as 4 to 5 year olds. There is limited interbreeding between the fall and summer Chinook due to differences in spawning time.

Figure 9-3

Figure 9-3

Figure 9-4

Figure 9-4

Figure 9-5

Figure 9-5

Summer Chinook spawn from mid September through October with a peak in mid October. Juveniles gradually make their way downstream by the following June as stream temperatures increase. All Nehalem summer chinook enter the ocean at less than one year old (ODFW, 1993).

Fall Chinook primarily enter the river system during September and early October. They spawn in November as 4 to 5 year olds. Juveniles emerge in March and April and promptly move downstream to larger rivers and the estuary for rearing. Most fall chinook migrate to the ocean prior to their first winter.

Nehalem summer chinook tend to concentrate in high densities on suitable gravel bars for spawning. Gravel removal operations in summer chinook spawning areas on the mainstem have been reduced and may soon be eliminated through agreements and citations. Critical habitat areas for summer chinook include the middle reaches of the mainstem Nehalem and Rock Creek below Selder Creek (Weber, 1999).

Adequate spawning gravel, instream structure and estuary habitat and are important for fall chinook spawning and rearing. The Nehalem Bay and adjacent marshlands have been affected by moderate urban development, and more extensively by diking, channelization, and draining of marshlands for agricultural use (Kostow, 1995). Important stream habitat includes Humbug Creek, the Salmonberry River, Cook Creek, Buster Creek, Cronin Creek, Soapstone Creek, God's Valley Creek and the North Fork Nehalem above God's Valley Creek (Weber, 1999).

There have been no historical accounts of hatchery supplementation of summer chinook. Spring chinook were released in the drainage between 1922 and 1965. The spring chinook had similar spawning times to the Nehalem summer chinook, so there may have been some interbreeding, however returns of the spring chinook were extremely low due to use of nonresistant stock to the *C. shasta* parasite (ODFW, 1993). Fall chinook were released in small numbers (less than 2,000 fry annually) from 1924 until 1985. The releases were discontinued due to poor returns also attributed to nonresistant stocks to *C. shasta*.

Coastal Cutthroat Trout

Data is somewhat lacking for coastal cutthroat trout populations. Fossil studies have suggested that coastal cutthroat trout may have been the first salmonid to colonize the western U.S. (Johnson et al., 1999). Kostow (1995) reported current sea-run cutthroat trout populations in the lower Nehalem River and the North Fork Nehalem. Resident cutthroat trout were documented in tributaries of the mainstem Nehalem including Cronin Creek, Spruce Run Creek, Lost Lake Creek, Humbug Creek, Lost Creek, and Quartz Creek. All of the resident populations are isolated above waterfall barriers.

Abundance trend data is not available for coastal cutthroat trout. However, fish counts at dams have raised concerns that there is a widespread decline in cutthroat trout populations. Oregon is near the extreme southern edge of the range of this species, so it may be particularly vulnerable to changes in climate and habitat loss (Kostow, 1995).

A petition for threatened listing was filed in December, 1997 by many fish and wildlife groups which stated that there were no healthy coastal cutthroat trout populations on the Oregon Coast. The proposal is still being considered by NMFS and a final decision is expected in April,

2000. In a status review completed in January, 1999 by NMFS scientists it was concluded that there were concerns about reductions in abundance of sea-run cutthroat trout along Oregon coastal streams, but that the populations are not presently at risk of extinction. There was uncertainty whether the populations are likely to become endangered in the foreseeable future due to lack of data.

Sea-run cutthroat trout begin their upstream migration between July and December. They tend to spawn in very small tributaries (1^{st} and 2^{nd} order). Young fry move into channel margin and backwater habitats during the first several weeks. Juveniles overwinter in low velocity pools and side channels with complex habitat created by large wood (Kostow, 1995). They usually spend about 2 years in the streams before migrating downstream in the spring.

Cutthroat trout habitat use is affected by interactions with more dominant salmonids. Cutthroat trout are often displaced into riffles and further upstream habitats by coho and steelhead. This tendency to separate probably helps reduce chances of interbreeding thereby conserving genetic fitness.

Sea-run cutthroat were released for several decades in Nehalem basin stream. Stocks from the Alsea River, and more recently, from the North Fork Nehalem were used. Stream releases were discontinued on the mainstem Nehalem after 1993 and on the North Fork Nehalem after 1994. The number of returns is unknown. In the last 10 years, there has been a change from planting hatchery coastal cutthroat trout into streams to restricting plants to lakes and ponds (Johnson et al., 1999).

Current Fish Habitat Conditions

ODFW stream surveys were used for this section. ODFW surveys stream reaches as a means to determine habitat distribution and quality. The field data focuses on channel and valley morphology, riparian characteristics and condition, and instream habitat. Reach lengths vary from ¼km. to 8 km. Surveys occur annually, however, new surveys do not occur within every basin annually. Not all streams within the Nehalem Drainage have been surveyed (See Figure 9-6). Survey information which is available was done in the summers of 1993 to 1997.

It should be noted that stream survey data reflects the condition of the stream at the time of the survey. Streams are dynamic systems that may change with every high and low flow event. The flooding events in 1996 may have altered the conditions reported in many of the reaches. Only Buster Creek was surveyed in 1997. Caution should be used in the use of this data. Current conditions should be verified by field verification before restoration efforts are planned and implemented.

Figure 9-6

Figure 9-6

For this assessment, survey data was evaluated in terms of habitat quality for presence of large woody debris, riffles and pools, and riparian vegetation. ODFW has established habitat benchmarks which indicate desirable and undesirable parameters for quality habitat. Several pieces of data were used to assign overall ratings. For example, the overall pool rating for each reach weighed pool area, pool frequency, residual pool depth, and complex pools. Ratings for individual stream reaches are provided in the appendix.

Pools are important rearing areas for juvenile salmonids. Pool frequency in surveyed reaches was generally adequate. Eighty-nine percent of the reaches had a desirable frequency of pools, however, the pool area was desirable in only 50% of the reaches and only 6% had desirable complex pools (pools with wood complexity). This general lack of large woody debris was verified by survey data. Forty-three percent of the reaches had a desirable quantity of large woody debris, but desirable volumes of large woody debris were only found in 19% of the reaches. There seems to be a lack of key pieces of large woody debris (> 0.6 m in diameter and > 10 m long). These pieces are important for pool formation and shelter. The lack of large woody debris is scattered throughout the surveyed reaches, but was more pronounced in Deep Creek, the East Fork Nehalem River, Elk Creek, Fall Creek, West Humbug Creek, Soapstone Creek, Calvin Creek, and Rock Creek.

Riffles with adequate gravel are important spawning areas. The percentage of gravel found was generally borderline throughout the surveyed reaches. There was a large percentage of silt and sand present (66% of reaches had undesirable quantities).

Riparian vegetation is important for shading of streams and for large woody debris recruitment into the stream. Both functions were evaluated in the Riparian Conditions section of this manual by analyzing aerial photos. In this section, shade and large woody debris were evaluated using the ODFW surveys. Shade was mostly adequate according to ODFW benchmarks (93% of surveyed reaches). No large river reaches were surveyed and only a few in the settled areas of the lower basin (Jetty Creek, portions of Foley Creek and Coal Creek). Riparian conifer trees were largely missing from the reaches surveyed. No reaches had desirable quantities of conifers and only 9 of the 270 reaches surveyed had borderline desirable quantities of conifers (all less than 20 inches in diameter at breast height). While hardwood trees appear to be providing adequate shade in the small reaches surveyed, large woody debris recruitment potential is limited.

Known Migration Barriers

Culvert data is largely unavailable. Private landowners are unwilling to provide information in most cases. In 1996 and 1997, the Oregon Department of Transportation and the Oregon Department of Fish and Wildlife cooperated in an effort to evaluate culverts related to state and county roadways. No privately owned or city roads were included. All culverts identified were categorized as either passable or deficient. Figure 7-1 includes the culverts which were found to be deficient according to one or more ODFW fish passage criteria. The culverts were further assigned a priority rating for repair. The ratings were based on the number and status of fish species present in the stream and the estimated quantity and quality of habitat blocked (ODFW, 1997). Nine culverts were rated high priority for repair. Coho salmon and cutthroat trout were noted to be present in all of the streams which had high priority culverts. Winter steelhead and chum were present in a few.

Data Gaps

1. More information is needed regarding historic salmonid population abundance and historic distributions.
2. Extensive field surveys of fish barriers are needed.
3. Habitat surveys are needed for all un-surveyed stream reaches and updated surveys are needed on a continual basis.
4. Reliable and regular fish counts are needed to track trends in fish populations (spawning adults, juveniles, hatchery releases and returns).
5. Macroinvertebrate data collected by the Nehalem watershed councils was not yet available (probably will be included in final draft of this manual).

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