10. AQUATIC RESOURCES AND THEIR HABITATS

10.1 INTRODUCTION

This habitat section describes the aquatic environment within the upper Nehalem watershed and ODF contiguous parcels and how that environment affects the distribution and abundance of aquatic resources in the watershed. Although other species exist within the watershed, the focus of this Chapter will be on seven anadromous fish species and two amphibian species. By exploring the following key questions we can begin to understand the connection between forest management practice and aquatic species and habitats in the target watersheds.

Key Questions:

1. *What fish species are documented in the watershed? Are any of these currently state or federally listed as endangered, threatened or candidate species? Are there any fish species that historically occurred in the watershed that no longer occur there?*
2. *What is the distribution, relative abundance and population status of salmonid species in the watershed? What is the distribution of fish species, by life stage, in the watershed?*
3. *Which salmonid species are native to the watershed, and which have been introduced into the watershed?*
4. *Are there potential interactions between native and introduced species?*
5. *What is the condition of the fish habitat in the watershed (by subbasin) according to existing habitat data?*
6. *Where are the potential barriers to fish passage? How many miles of fish-bearing streams are blocked by culverts?*
7. *What stream reaches have high, moderate, and low level of key pieces of large wood (> 24 inch conifer) in the channel?*
8. *Did any splash damming occur in the watershed? Where did this splash damming occur? Are the effects still apparent?*
9. *Are the tailed frog and Columbia torrent salamander potential present in the watershed? What are the habitat needs of these species?*

10.2 METHODS

The information obtained in this chapter was compiled from a review of the existing literature and data including existing watershed assessments and ODFW Aquatic Inventory Reports and ODFW and ODF data. Our task was to review and summarize the available information relative to the questions stated above and with respect to ODF management basins. Existing data for fish habitat was available only at the 5th field HUC level and not the level of ODF management basins. Figure 10-1 shows the relationship between the three relevant 5th field HUC and ODF management basins.

10.3 RESULTS

10.3.1 Fish Species in the Upper Nehalem River Basin

Table 10-1 lists some fish species documented in the upper Nehalem River and their current management status. All of these species are native to the Oregon coastal rivers. Warm water fish species have been introduced to Fishhawk Lake, near the Fishhawk Management Basin, and it is likely that rainbow trout from stocks outside the Nehalem River watershed have been planted in the basin. No information was available on the interactions between native and introduced fish. No information was available to document the extirpation of any native fish species from the Nehalem River basin.

Table 10-1. The management status of fish species documented in the upper Nehalem River.

Species	Life Histories Strategy	Management Status
Coho salmon *Oncorhynchus kisutch*	Anadromous	Proposed as threatened under federal ESA, as part of Oregon Coast ESU. State sensitive with critical status
Chinook salmon *O. tshawytscha*	Anadromous	Not currently listed
Steelhead *O. mykiss*	Anadromous	Candidate for listing under federal ESA. State sensitive with vulnerable status
Coastal cutthroat trout *O. clarki clarki*	Anadromous and Resident	Federal species of Concern State sensitive with vulnerable status
Pacific lamprey *Lampetra tridentata*	Anadromous	Federal species of Concern State sensitive with vulnerable status
Western Brook lamprey *L. richardsoni*	Resident	Not currently listed

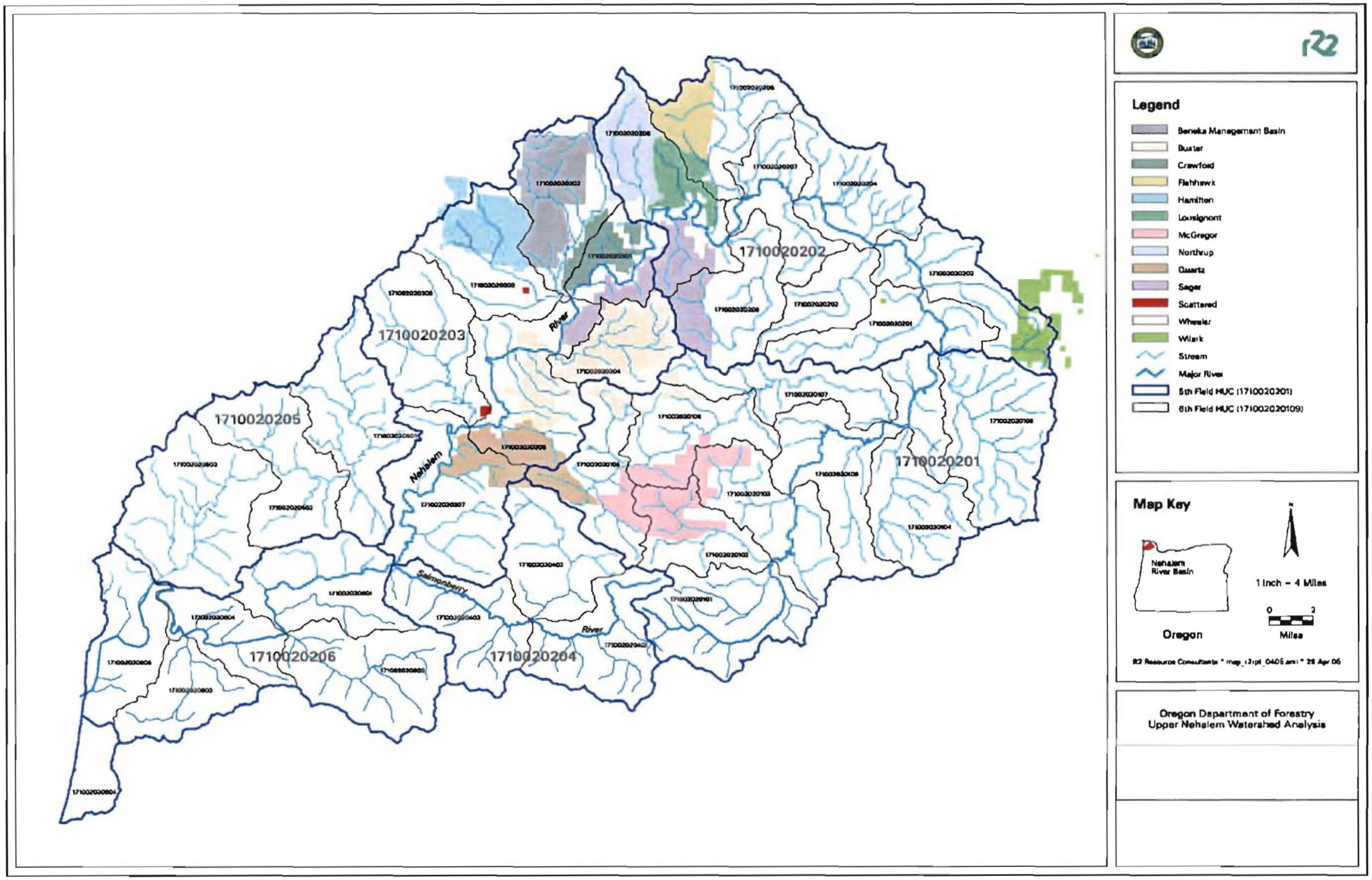


Figure 10-1. Project Area 5th and 6th Field HUCs.

10.3.1.1 Fish Distribution, Abundance, Status in the Upper Nehalem

Coho Salmon, *Oncorhynchus kisutch*

Distribution. Coho salmon are endemic to coastal rivers and streams of Oregon at the time of this assessment. They were widely distributed throughout the mainstem and larger tributaries of upper Nehalem River (Figure 10-2).

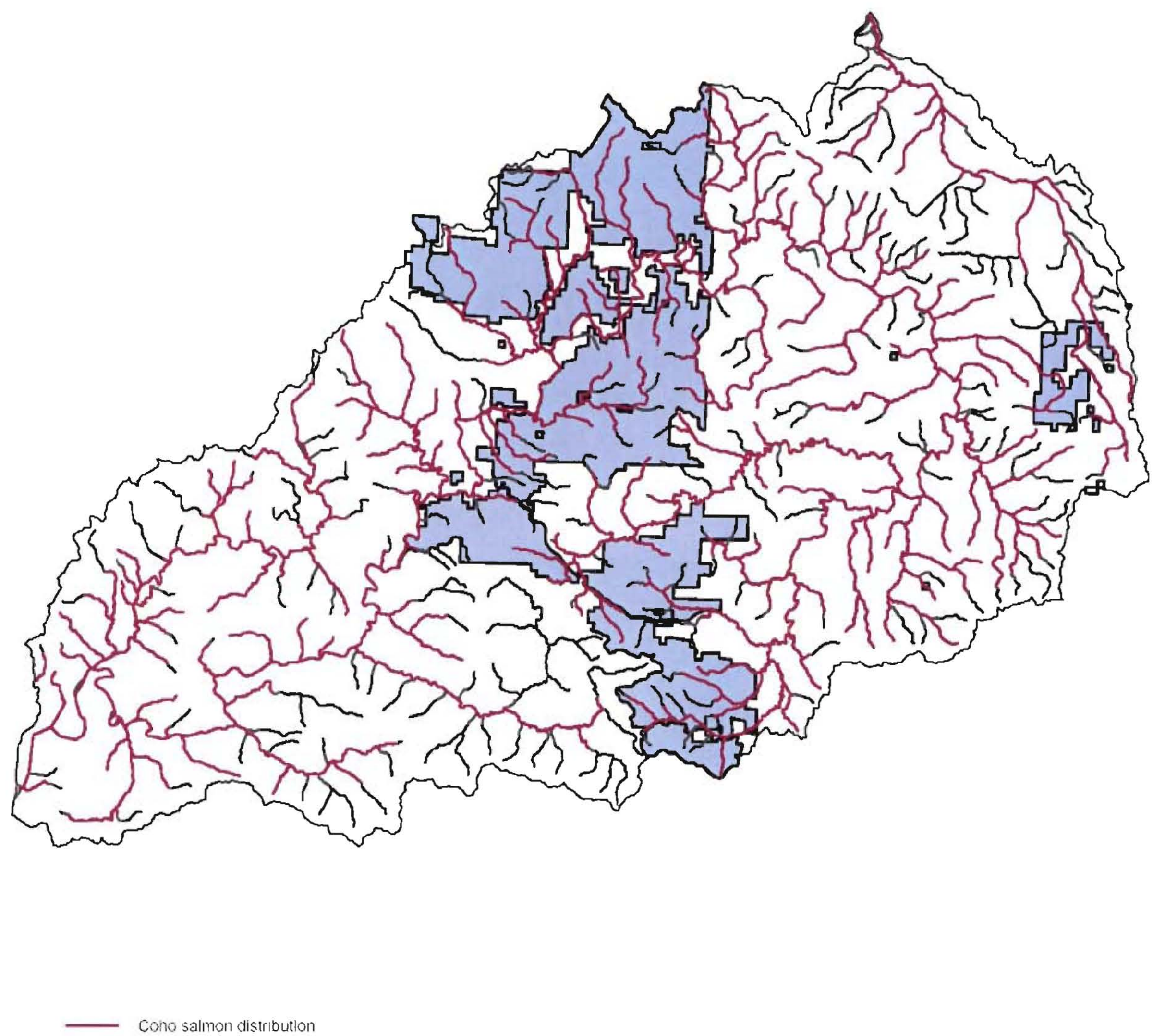


Figure 10-2. Coho salmon distribution in the Nehalem River basin.

Status. The coho salmon within the upper Nehalem are part of the Oregon Coast Evolutionary Significant Unit (ESU). The Oregon Coast ESU of coho salmon is a declining population and is currently proposed for listing under the federal Endangered Species Act. Estimates of abundance suggest that this ESU is currently at a level of 5 to 10 percent of historical abundance (Weitkamp et al. 1995).

Several factors have been identified as likely contributing to the population decline of coho salmon. These factors of decline include habitat destruction, overfishing, artificial propagation, and poor ocean conditions (Weitkamp et al. 1995). As in-channel habitat complexity, structure, and abundance of pool habitats are important for freshwater survival of coho salmon, reduction of these habitat characteristics may limit coho production (Nickelson et al. 1992).

Abundance. ODFW conducted coho salmon spawning surveys in the Nehalem River from 1998 to 2003. In general, densities of spawners increased from 1 to 5 wild adult coho per mile in 1998 to more than 200 per mile in 2002 and 2003 (Kavanagh et al. 2005).

Chinook Salmon, *O. tshawytscha*

Distribution. Within the Project Area, fall Chinook salmon were distributed in upper mainstem Nehalem River and the lower reaches of six tributaries (Figures 10-3 and 10-4) (Kavanagh et al. 2005).

Status. Chinook salmon in the Nehalem River basin are part of the Oregon Coast ESU. Chinook salmon in this ESU do not currently hold any special status at the state or federal level. Forty-five populations have been identified within this ESU (Kostow 1995). In the Oregon Coast ESU, habitat loss and degradation have been associated with human activities such as dam construction, water withdrawal, logging, and agriculture. Logging and agricultural practices were identified as resulting in modifications to stream structure and reduction of riparian habitat (Myers et al. 1998).

Abundance. A 5-year mean spawning escapement for the Oregon Coast ESU was estimated at 136,000 Chinook salmon and the long term trend has been determined to be stable or increasing (Myers et al. 1998). ODFW survey data show counts of spawning fall Chinook salmon to be 140 fish total in the Nehalem River (Kavanagh et al. 2005).

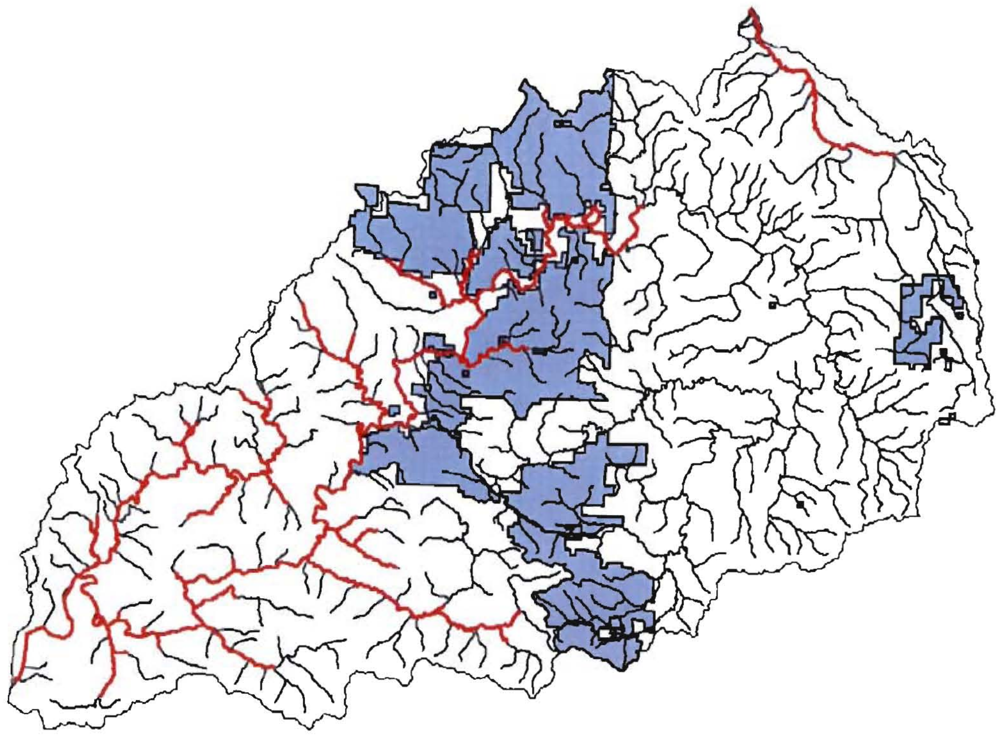


Figure 10-3. Fall Chinook salmon distribution in the Nehalem River basin.

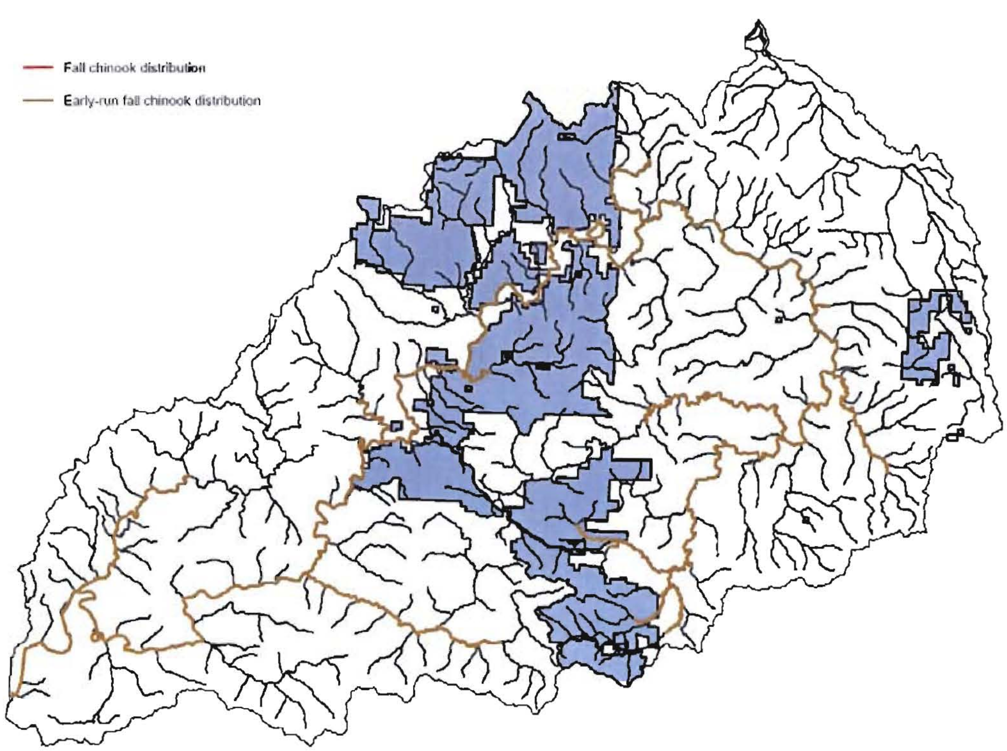


Figure 10-4. Early run fall Chinook salmon distribution in the Nehalem River basin.

Steelhead, *Oncorhynchus mykiss irideus*

Distribution. Winter steelhead were found throughout the mainstem Nehalem and larger tributaries (Figure 10-5) (Kavanagh et al. 2005). These authors also reported that steelhead have access to all historic habitat in the upper Nehalem basin.

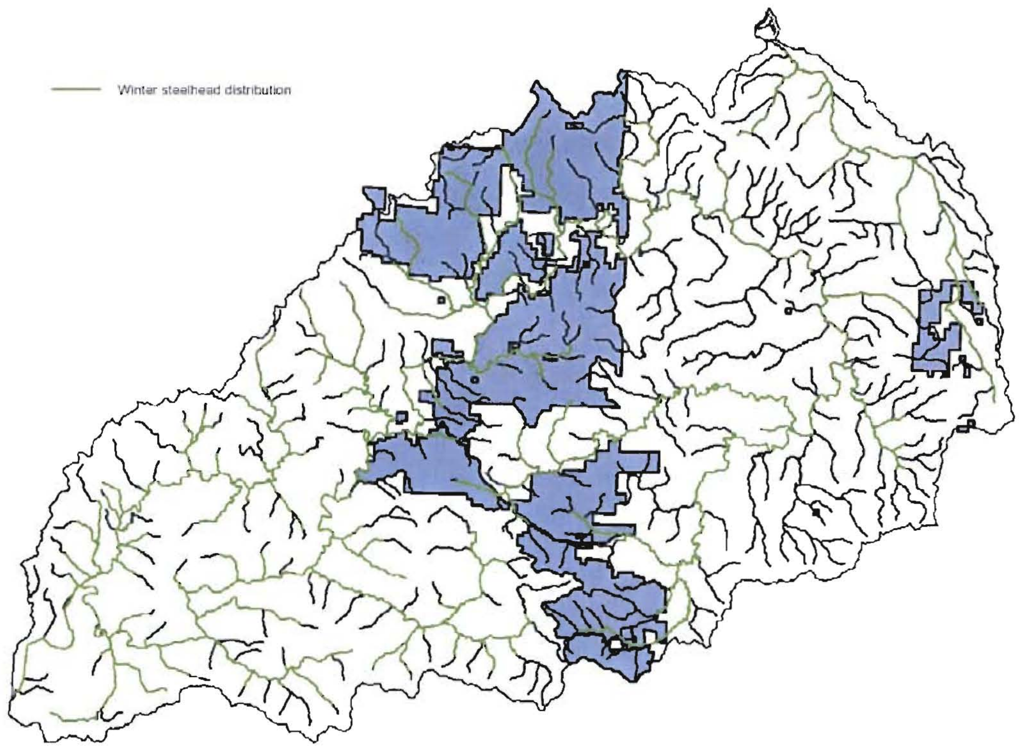


Figure 10-5. Steelhead distribution in the Nehalem River basin.

Status. The Oregon Coast ESU of steelhead is a candidate for federal listing under the ESA. Past run size and escapement estimates have been based on expansions of angler catch using assumed harvest rates. Total 5-year mean escapement for major streams in the Oregon ESU was 96,000 steelhead (82,000 winter, 14,000 summer). These totals did not include all streams in the ESU, and thus were thought to be an underestimate. Due to concerns with the method of escapement estimation, NOAA Fisheries conducted a trend analysis for 42 independent stocks within the Oregon Coast ESU (Busby et al. 1996). Thirty-six stocks were found to have a declining trend and 6 exhibited increases evident during the available data series.

Kostow (1995) reported the habitat degradation has impacted steelhead populations in the mid-Oregon coastal streams. She notes specifically siltation, loss of structural complexity, and loss of riparian habitat from road building and logging. Additional threats include channelization, water withdrawals, and development. Busby et al. (1996) reported similar threats to coastal salmonid populations and added concerns regarding streamflow and temperature in areas where there are significant water withdrawals or removal of streamside vegetation had occurred.

Abundance. ODFW recently (2003 and 2004) conducted steelhead surveys in the mainstem Nehalem and Rock Creek. Data varied over time and survey location, but average redd densities that ranged from 2.2 to 20.7 redds per mile (Kavanagh et al. 2005).

Coastal Cutthroat Trout, *Oncorhynchus clarki*

Distribution. Cutthroat trout were widely distributed throughout the upper Nehalem River basin (Figure 10-6) (Kavanagh et al. 2005).

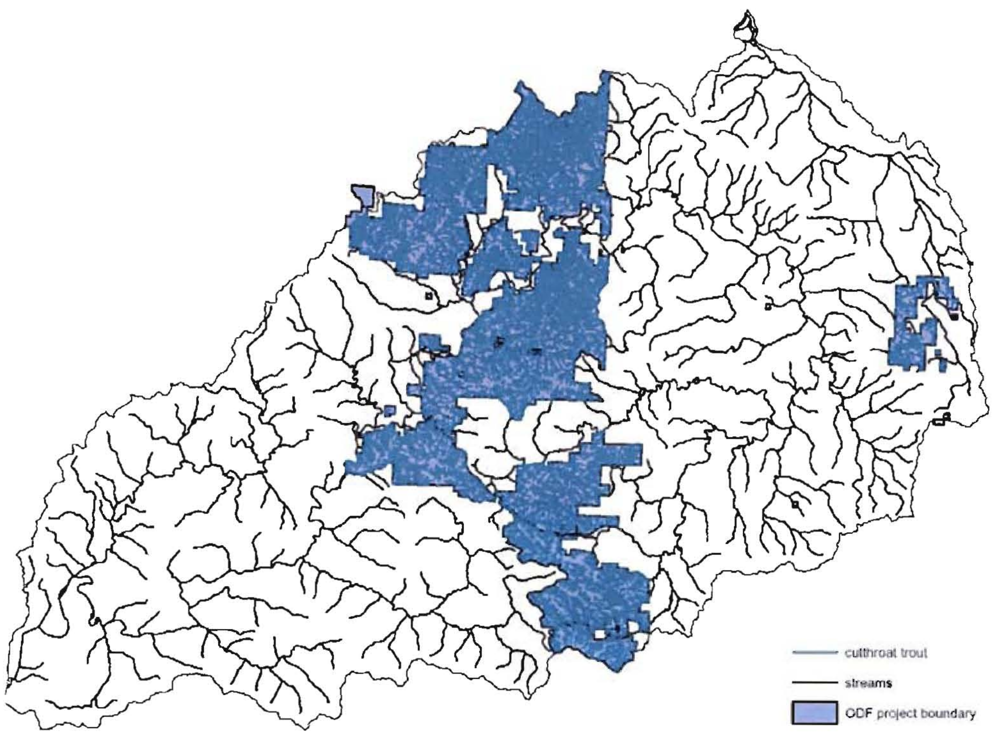


Figure 10-6. Cutthroat trout distribution in the Nehalem River basin.

Status. Coastal cutthroat trout in the Nehalem River Basin are part of the Oregon Coast ESU. Data on adult abundance in this ESU were available for only a few streams and would not be indicative of the status of the ESU as a whole. Thus, NOAA Fisheries used other available information to evaluate population trends for this ESU in 1999 (Johnson 1999). An analysis of recreational harvest data indicated that the numbers of larger fish have been declining; however trends in juvenile abundance have been stable or positive in most locations (Johnson et al. 1999). Additional information compiled by ODFW indicates that declining trends were evident for wild populations of anadromous cutthroat trout based on recreational fisheries data (Johnson et al. 1999). Resident populations however, were reported to be relatively stable (Johnson et al. 1999).

Habitat degradation appears to be the prime concern regarding the future status of coastal cutthroat trout populations. Habitat degradation and increases in stream temperatures have been noted in many small tributaries in the Oregon coastal region (Kostow 1995). More specifically, Johnson et al. (1999) reported that logging practices have been shown to decrease instream habitat quality due to increases in water temperature and siltation, removal of large wood, changes in river basin hydrology, and placement of culverts. The increased culvert numbers in coastal cutthroat trout streams was noted as a serious threat because of their effectiveness in compromising fish migrations (Johnson et al. 1999). The reduction in habitat connections among streams has been described as a potentially significant threat to coastal cutthroat trout populations (Johnson et al. 1999).

Abundance. No data was available on the abundance of cutthroat trout in the upper Nehalem River.

Pacific Lamprey, *Lampetra tridentata*

Distribution. Pacific lamprey were distributed throughout coastal rivers and stream in Oregon and throughout the Columbia River basin (Kostow 2002). Pacific lamprey were present in the Nehalem River basin (Kavanagh et al. 2005) although their exact distribution was not known.

Status. Pacific lamprey were petitioned for listing under the federal ESA but the listing was determined not warranted. However, available count data from two Columbia River dams and two dams on the Oregon Coast all indicated that this species may have declined from levels detected in 1970 (Kostow 2002). Freshwater habitat degradation was likely the most significant threat to Pacific lamprey populations. Potential habitat issues were reviewed in Kostow (2002). Habitat issues that potential impact lamprey ammocoetes include siltation, water pollution, hydrologic modifications, and development in or above rearing areas. Migrating adult lamprey have difficulty negotiating fish ladders, thus dams and perched culverts could eliminate access to spawning habitats.

Abundance. Lamprey redds were counted on 2003 and 2004 ODFW steelhead surveys in the Nehalem River. Counts averaged from 14 to 30 redds per mile (Kavanagh et al. 2005).

Western Brook Lamprey, *Lampetra richardsoni*

Distribution. Western brook lamprey was distributed throughout coastal rivers and streams in Oregon and are present in the Nehalem River basin (Kostow 2002) although their exact distribution was not known.

Status. Western Brook lamprey were petitioned for listing under the federal ESA but the listing was determined not warranted. Freshwater habitat degradation is likely the most significant threat to lamprey populations. Potential habitat issues were reviewed in Kostow (2002). Habitat issues that potential impact lamprey ammocoetes include, siltation, water pollution, hydrologic modifications, and development in or above rearing areas.

Abundance. No data were available on the abundance of Western Brook lamprey in the upper Nehalem River.

10.3.2 Fish Habitat in the Upper Nehalem River

Data on the habitat condition in the upper Nehalem River was obtained from Kavanagh et al. (2005). In the Nehalem River basin, ODFW Aquatic Inventory Habitat surveys were conducted from 1992 to 2004. Within the Project Area, surveys were restricted to tributary habitats and covered approximately 288 km of stream habitat (Kavanagh et al. 2005). During these surveys data were collected to describe the stream channel morphology, riparian characteristics and instream habitat features during low flow conditions. Details on the specific methods used can be found in Moore et al. (1999). Summary data on the habitat conditions for upper Nehalem streams was taken from Kavanagh et al. (2005) and can be found in Table 10-2. Overall these streams were reported to have habitat in fair to good condition (Kavanagh et al. 2005).

Kavanagh et al. (2005) analyzed the survey data collected and reported on the health of the upper Nehalem streams by comparing survey data to reference stream conditions. Reference stream conditions were obtained from 124 sites that were located in Oregon Coastal streams and were deemed to have experienced only low impact from human activities, such as sites within roadless areas, wilderness sites, or sites within late-successional or mature forests (Kavanagh et al. 2005). Fifteen habitat attributes were averaged for the three 5th field HUCs that overlap with the Project Area and compared with reference values for those same variables. The following results are summarized from Figures 1 through 6 of Kavanagh et al. (2005).

The results of the comparison showed the upper Nehalem streams had fewer high gradient reaches and more reaches with a narrower active channel width than Reference streams. The Upper Nehalem streams showed similar habitat ratings for 6 attributes including: percent gravel in riffles, percent bedrock, density of deep pools, percent pool habitat, percent secondary channel

Table 10-2. Upper Nehalem River Habitat Summaries by 5th Field HUC. Data obtained from Kavanagh et al. (2005).

ODF NEHALEM PROJECT AREA: HUC 1710020203
REACH SUMMARY

STREAM	SURVEY DATE	REACH LENGTH (m)	% AREA IN SIDE CHANNELS	GRADIENT	VWI	*VALLEY FORM	*CHANNEL FORM	*LAND USE DOM	*LAND USE SUB-DOM	SHADE %	BEDROCK %	FINES IN RIFFLES %	GRAVEL IN RIFFLES %	LARGE BOULDERS #/100m
BENEKE CR	7/7/1999	1065	5.9	4.7	3.3	CT	CA	YT		86	11	40	14	0.3
BENEKE CREEK	7/19/2001	6774	6.0	0.3	38.2	CT	CT	LG	AG	73	11	9	39	3.2
BENEKE CREEK	7/29/2001	2056	8.5	2.2	24.1	CT	CA	ST	AG	76	8	7	40	19.8
BENEKE CREEK	8/1/2001	2536	5.1	2	7	MT	CA	ST	YT	84	9	10	27	49.6
BENEKE CREEK	8/7/2001	1981	4.2	3.3	3.7	MT	CA	ST	LT	91	23	13	41	50.8
BENEKE CREEK	8/9/2001	1225	12.7	5	2.8	MT	CT	ST	YT	98	6	19	24	83.8
BENEKE CREEK	8/14/2001	1300	8.7	10.1	7.5	MT	CA	PT	ST	92	2	46	51	51.8
BENEKE CREEK	8/15/2001	633	10.7	18.4	1.2	SV	CH	PT	LT	85	0	95	5	19.3
BENEKE CREEK	8/24/1993	3049	4.4	0.4	20	CT	CT	AG		86	20	8	42	6.0
BENEKE CREEK	8/26/1993	6584	7.2	0.5	16.8	MT	CA	AG		87	8	9	55	4.8
BENEKE CREEK	9/10/1993	3349	13.6	0.7	7.5	MT	CT	TH		82	6	12	44	21.1
BULL HEIFER CREEK	6/22/1998	535	8.7	2.7	6.5	MT	CA	ST		90	5	32	22	5.4
BULL HEIFER CREEK	8/20/2001	1007	11.1	2.8	6	MT	CA	ST	LT	91	6	25	25	104.9
BULL HEIFER CREEK	8/22/2001	1564	3.3	7.3	2.8	MT	CA	LT	ST	94	2	58	21	74.7
BULL HEIFER CREEK TRIB A	8/27/2001	2227	8.1	4.7	5.5	MT	CT	ST	LT	95	7	34	24	150.4
BUSTER CR	8/16/1999	967	5.5	0.9	10.8	CT	CT	YT		84	2	37	33	0.0
BUSTER CR TRIB	8/20/2001	848	0.0	0.8	12.9	MT	US	ST		64	0	87	13	0.0
BUSTER CREEK	8/7/1997	1192	9.1	1.3	1.9	MV	CH	ST		93	4	8	60	8.2
BUSTER CREEK	8/11/1997	1668	4.6	1.4	1	MV	CH	ST		92	15	5	39	27.6
BUSTER CREEK	8/11/1997	524	15.9	1.5	6.2	CT	CA	ST		93	10	5	48	8.6
BUSTER CREEK	8/12/1997	772	45.0	2.2	5	MT	UA	YT	ST	91	1	9	53	18.1
BUSTER CREEK	8/14/1997	1473	8.6	1.2	2.4	CT	CA	ST	YT	89	3	18	57	39.0
BUSTER CREEK	8/14/1997	934	2.4	0.3	8.5	CT	CT	ST	YT	91	0	9	92	0.2
BUSTER CREEK	8/18/1997	1802	3.4	0.7	9.8	MT	US	ST	YT	88	0	9	85	0.7
BUSTER CREEK	8/19/1997	1053	3.7	0.7	9.2	MT	US	ST	YT	95	1	9	86	0.8
BUSTER CREEK	8/19/1997	1307	8.4	0.9	6.4	CT	CT	YT	ST	92	5	10	78	0.1
BUSTER CREEK	8/21/1997	306	13.7	1.1	7.5	MT	US	ST		94	5	7	78	0.0
BUSTER CREEK	8/21/1997	1944	3.1	1.6	11.2	CT	CT	ST		91	1	39	55	2.4
BUSTER CREEK TRIB (NC-2390)	8/12/2002	885	2.9	1.2	8.5	MT	US	ST		88	0	94	6	0.0
BUSTER CREEK TRIB A	6/25/1998	562	1.8	0.6	6.2	MT	CA	ST		90	0			0.0
BUSTER CREEK TRIB C (NC-2356)	8/14/2002	496	3.1	7.5	2	MV	CH	YT		100	2	0	50	0.4
BUSTER CREEK TRIBUTARY A1	6/11/2002	1237	3.2	5.7	4.3	CT	CA	LT	ST	100	9	55	38	0.0
BUSTER CREEK TRIBUTARY A3	6/10/2002	545	0.3	2.5	3.2	MT	US	MT	ST	99	1	64	36	0.0
BUSTER CREEK TRIBUTARY A3	6/10/2002	652	4.8	8.5	2.1	SV	CH	MT	ST	99	12	65	25	0.0
COW CR	8/23/2000	583	5.9	6.1	2.9	CT	CT	ST		91	19	9	22	2.4
COW CREEK	8/1/1995	2999	11.4	1.4	6.2	CT	CT	RR		80	0	14	48	3.4
COW CREEK	8/7/1995	1949	8.1	2.7	3.1	CT	CA	TH	ST	85	5	13	47	8.0
COW CREEK	8/9/1995	3656	7.0	6.1	1.2	MV	CH	TH	ST	94	24	18	43	24.8
COW CREEK (NC-1149)	8/20/2003	1000	8.7	5.1	2.4	CA	CT	ST		85	21	13	34	81.0
CRAWFORD CR	8/23/2001	952	0.3	2.2	3.9	CT	CA	ST	MT	85	0	68	23	0.7
FISHHAWK CREEK (JEWEL)	10/4/1995	3464	2.4	1.5	4.9	WF	US	ST	LT	85	7	23	29	1.7
FISHHAWK CREEK (JEWEL)	10/4/1995	843	1.9	5.5	1.8	MV	CH	LT	ST	92	0	16	30	0.2
FISHHAWK CREEK TRIB A	10/10/1995	823	0.8	2.5	3	CT	CA	LT	ST	88	9	18	31	0.7
FISHHAWK CREEK TRIB A	10/10/1995	1603	0.9	4	2.2	MV	CH	YT	TH	75	2	21	35	0.0
GILMORE CR	8/24/2000	650	3.4	3.3	2.5	CT	CA	ST		91	2	15	15	0.0
GILMORE CREEK	9/11/2001	1616	7.4	3.2	6.1	CT	CA	ST		88	3	48	36	2.2
GILMORE CREEK	9/17/2001	700	6.3	10	1.7	MV	CH	ST		91	6	53	40	3.3
GILMORE CREEK (NC-2154)	8/19/2003	1004	5.4	4.5	3.4	CT	CA	ST		92	11	40	40	6.9
GILMORE CREEK TRIB A	9/18/2001	2001	0.0	2.5	5.5	MT	CT	ST		87	1	40	43	0.2
GILMORE CREEK TRIB A	9/19/2001	1022	3.5	9.4	1.8	MV	CH	ST		93	8	22	65	5.5
HAMILTON CREEK	9/14/1993	1095	8.0	1.3	6.6	MT	CT	TH	YT	86	10	20	30	2.8
HAMILTON CREEK	9/14/1993	2540	5.5	2.3	2.7	MT	CA	TH	YT	89	5	20	34	8.6
HAMILTON CREEK	9/16/1993	2019	7.5	3.4	2.1	MV	CH	TH		99	9	22	19	11.6

Table 10-2. (cont) Upper Nehalem River Habitat Summaries by 5th Field HUC. Data obtained from Kavanagh et al. (2005).

ODF NEHALEM PROJECT AREA: HUC 1710020203
REACH SUMMARY

STREAM	SURVEY DATE	REACH LENGTH (m)	% AREA IN SIDE CHANNELS	GRADIENT	VWI	*VALLEY FORM	*CHANNEL FORM	*LAND USE DOM	*LAND USE SUB-DOM	SHADE %	BEDROCK %	FINES IN RIFFLES %	GRAVEL IN RIFFLES %	LARGE BOULDER #/100m
HAMILTON CREEK TRIB A	9/23/1996	783	2.5	3.4	3.8	MT	US	LT		98	16	17	26	8.6
HAMILTON CREEK TRIB A	9/25/1996	1364	7.7	4.5	2.1	MV	CH	YT	LT	90	7	15	32	14.9
HAMILTON CREEK TRIB A	9/25/1996	326	5.4	9.4	1.5	MV	CH	LT		98	7	15	22	5.2
HAMILTON CREEK TRIB A1	9/23/1996	1070	4.8	6.9	2.5	MV	CH	LT		99	6	19	63	9.3
HAMILTON CREEK TRIB B	9/24/1996	405	15.0	8.9	1.2	MV	CH	ST	LT	96	2	10	30	51.9
HAMILTON CREEK TRIB B	9/24/1996	621	3.5	5.2	2.1	MV	CH	YT	ST	79	5	15	28	12.9
HAMILTON CREEK TRIB B	9/24/1996	963	2.6	8.6	1.6	MV	CH	YT	LT	99	6	15	30	9.6
KLINES CREEK	7/19/1995	2613	3.9	2	6.8	CT	CT	LG		79	0	20	65	1.5
KLINES CREEK	7/24/1995	3836	19.9	6.8	1.8	MV	CH	LT		90	1	16	61	11.0
KLINES CREEK	7/31/1995	1172	4.7	6.6	1.9	MV	CH	ST		88	0	0	0	0.0
MOORES CREEK	7/12/1995	1415	5.1	2.6	4.2	MT	UA	YT		82	0	29	46	0.3
MOORES CREEK	7/17/1995	2193	3.0	7	1.9	MV	CH	ST		89	0	23	49	3.1
NETTLE CREEK	6/20/2000	395	24.6	6.4	10.7	MT	US	ST		95	0	29	37	0.0
NETTLE CREEK	6/21/2000	297	2.6	10.7	5.7	MT	US	YT	ST	85	2	27	57	0.0
NETTLE CREEK	6/26/2000	734	1.0	12.9	1.8	MV	CH	YT		79	1	27	38	0.0
NETTLE CREEK	6/28/2000	1406	1.9	9.2	2.2	MV	CH	ST		95	0	22	53	1.5
NORTH FORK QUARTZ CREEK	7/22/1996	1159	13.6	5.5	1.6	MV	CH	ST		99	5	30	43	19.8
NORTH FORK WALKER CREEK	7/13/1994	2063	7.8	9	1.8	MV	CH	ST		100		7	31	7.6
OSWEG CREEK	7/13/1998	520	8.6	16.1	5	CT	CA	ST	MT	96	0	86	13	9.2
OSWEG CREEK	8/21/1995	1680	27.4	9.4	1.2	MV	CH	YT		94	0	22	63	16.5
OSWEG CREEK	8/22/1995	1028	· 1.3	8.9	1.1	MV	CH	ST		94	0	30	65	1.8
QUARTZ CREEK, SURVEYED AS NF	7/16/1996	2090	8.9	3.1	4.1	MT	CA	RR		82	2	21	33	3.8
QUARTZ CREEK, SURVEYED AS NF	7/17/1996	995	9.9	5.4	1.8	MV	CH	ST		86	1	22	31	34.2
QUARTZ CREEK, SURVEYED AS NF	7/18/1996	572	2.3	12.7	1	SV	CH	ST		84	19	38	37	55.8
SLAUGHTERS CREEK	7/27/1997	548	1.7	2.6	1	MV	CH	MT		97		36	55	11.1
SLAUGHTERS CREEK	7/28/1997	594	6.0	2.7	1.4	MV	CH	MT	YT	89		22	66	0.5
SOUTH FORK QUARTZ CREEK	7/23/1996	373	0.0	12.7	2.7	MV	CH	SR		94	9	7	33	193.8
SOUTH FORK QUARTZ CREEK	7/24/1996	870	2.4	3	3.6	MT	CA	ST		97	5	28	45	47.8
SOUTH FORK WALKER CREEK	7/18/1994	285	1.1	5.9	1	MV	CH	ST		98	13	9	42	15.1
STANLEY CREEK	9/4/1997	582	4.4	3.1	7.2	MT	US	ST		98	.7	5	58	27.7
STANLEY CREEK	9/8/1997	281	1.9	3.9	1.8	MV	CH	ST		95	14	10	62	26.0
STANLEY CREEK	9/8/1997	542	15.7	2.5	2.5	MT	US	ST		100	17	37	45	56.5
STANLEY CREEK	9/9/1997	1466	4.2	8.6	2	SV	CH	ST		95	14	6	51	116.2
STANLEY CREEK	9/11/1997	519	12.0	6.3	3.4	MT	US	YT	ST	90	1	15	53	9.2
TRAILOVER CREEK	9/24/2001	2026	2.4	2.9	9.2	CT	CT	ST		85	6	22	48	0.1
TRAILOVER CREEK	8/30/1994	1425	4.0	2.8	5.8	CT	CA	LT		92	1	30	34	0.1
TRAILOVER CREEK	5/13/1997	2870	1.8	7.8	1.3	MV	CH	YT	ST	90		27	53	4.8
WALKER CREEK	6/20/1994	8013	2.9	0.6	14.6	CT	CA	YT		89	14	9	63	1.6
WALKER CREEK	6/23/1994	2182	11.9	1.1	13.4	MT	CA	YT		76	6	11	47	2.3
WALKER CREEK	6/30/1994	2269	7.7	1.6	2.6	MT	CA	LT	ST	91	25	6	42	8.8
WALKER CREEK	7/5/1994	270	0.0	1.4	2	MV	CH	ST		97	6	3	28	15.9
WALKER CREEK	7/5/1994	688	5.3	2	2.9	MT	CA	YT		86	23	5	31	11.5
WALKER CREEK	7/6/1994	2104	13.6	3	1.4	SV	CH	ST		97	20	12	35	5.9
WALKER CREEK	8/29/1997	1994	0.7	0.6	12.4	CT	CT	YT		77	0	55	43	0.1
WALKER CREEK	9/1/1997	3288	2.0	0.6	4.2	CT	CA	ST		95	3	16	81	1.6
WALKER CREEK (NC-2130)	8/7/2002	1009	0.5	0.7	6	CT	CA	ST		73	1	17	77	5.2

Table 10-2. (cont) Upper Nehalem River Habitat Summaries by 5th Field HUC. Data obtained from Kavanagh et al. (2005).

ODF NEHALEM PROJECT AREA: HUC 1710020203
REACH SUMMARY

STREAM	REACH LENGTH (m)	ACTIVE CHANNEL WIDTH (m)	CHANNEL WIDTHS/ POOL	PERCENT POOLS	PERCENT SLACKWATER POOLS	POOLS >1m DEEP/km	RESIDUAL POOL DEPTH (m)	WOOD DEBRIS PIECES #/100m	WOOD DEBRIS VOLUME (m3)/100m	KEY PIECES #/100m	CONIFER TREES TOTAL/1000ft	RIPARIAN CONIFERS #>20in dbh /1000ft	RIPARIAN CONIFERS #>35in dbh /1000ft
BENEKE CR	1065	5.2	57.9	3.3	0.4	0.8	0.53	14	46	3.2	650	0	0
BENEKE CREEK	6774	14.8	4.2	74.0	2.4	8.2	0.9	10	14	0.3	75	27	7
BENEKE CREEK	2056	9.7	2.7	65.4	3.2	13.1	0.72	18	20	0.6	102	20	0
BENEKE CREEK	2536	10.5	3.6	44.1	7.7	5.4	0.62	29	29	0.9	329	49	12
BENEKE CREEK	1981	7.6	5.1	34.3	11.2	0.5	0.39	34	46	1	219	98	12
BENEKE CREEK	1225	6.3	6.1	16.9	1.7	0.6	0.29	20	54	1.9	549	46	0
BENEKE CREEK	1300	3	9.3	9.4	0.3	0	0.23	30	79	3.8	442	168	0
BENEKE CREEK	633	2.5	144.7	0.3	0.0	0	0.19	14	37	1.9	914	427	0
BENEKE CREEK	3049	19.9	4.9	39.8	0.4	3.7	0.7	14	12	0.5	0	0	0
BENEKE CREEK	6584	16.3	7	26.6	1.6	4.2	0.8	30	28	1	18	6	6
BENEKE CREEK	3349	14.2	2.9	40.8	10.9	2.6	0.6	49	50	1.2	163	42	6
BULL HEIFER CREEK	535	8.8	4	27.9	12.4	3	0.53	28	49	2.6	163	0	0
BULL HEIFER CREEK	1007	7.5	3.8	28.4	0.1	0.8	0.38	29	41	1.9	142	0	0
BULL HEIFER CREEK	1564	4.2	5.5	44.8	38.4	1.2	0.44	21	55	1.2	599	295	51
BULL HEIFER CREEK TRIB A	2227	6.3	4.5	30.0	14.6	1.5	0.44	26	49	1.1	183	52	0
BUSTER CR	967	13	2.4	74.1	0.4	6.7	0.58	28	37	2.3	61	20	20
BUSTER CR TRIB	848	4.7	8.2	94.8	91.5	1.2	0.62	11	11	0.2	1097	0	0
BUSTER CREEK	1192	15.7	3.1	49.6	0.0	6.1	0.6	18	41	1.8	549	61	0
BUSTER CREEK	1668	16.6	3.4	47.8	0.2	5.7	0.8	14	21	0.5	168	30	0
BUSTER CREEK	524	12.5	3.1	65.6	1.7	2.7	0.6	17	32	1	30	0	0
BUSTER CREEK	772	20.8	2.8	32.8	0.0	1.8	0.5	26	26	0.4	274	0	0
BUSTER CREEK	1473	12.7	3.8	62.0	14.2	5.8	0.6	21	26	0.6	224	20	0
BUSTER CREEK	934	11.5	5.3	91.6	30.0	9.3	0.7	15	17	0.6	0	0	0
BUSTER CREEK	1802	11.2	2.9	80.5	1.8	7.6	0.7	16	19	0.3	198	15	15
BUSTER CREEK	1053	8.9	3.7	83.1	2.2	7.3	0.7	18	19	0.2	508	81	20
BUSTER CREEK	1307	8.4	3.5	85.6	1.3	2.7	0.6	15	23	0.7	325	20	0
BUSTER CREEK	306	7.1	4.5	76.7	0.0	2.8	0.5	24	42	0.7	183	0	0
BUSTER CREEK	1944	3.7	5	78.8	20.7	0.5	0.3	18	30	1.3	137	15	0
BUSTER CREEK TRIB (NC-2390)	885	3.4	6.9	64.6	14.0	0	0.29	23	40	1.6	264	0	0
BUSTER CREEK TRIB A	562	5.2	6.4	73.0	73.0	21.4	0.34	45	259	4.8	264	102	0
BUSTER CREEK TRIB C (NC-2356)	496	3.9	22.4	2.4	0.0	0	0.05	16	35	1.6	0	0	0
BUSTER CREEK TRIBUTARY A1	1237	2.1	10.3	40.6	9.3	0.7	0.36	26	44	1.1	500	85	0
BUSTER CREEK TRIBUTARY A3	545	3	6.5	64.7	1.3	0	0.47	29	97	1.3	945	244	0
BUSTER CREEK TRIBUTARY A3	652	2.7	10.9	48.7	3.1	0	0.38	16	40	0.6	1006	213	0
COW CR	583	6.8	13.7	11.9	0.0	1.5	0.53	22	7	0	122	41	0
COW CREEK	2999	11.1	3.3	35.1	11.7	0.3	0.4	4	3	0.1	70	0	0
COW CREEK	1949	7.8	11.8	9.4	0.2	0.4	0.3	23	19	0.5	41	0	0
COW CREEK	3656	6.4	9.3	11.9	0.1	0.2	0.4	21	42	1.4	504	28	0
COW CREEK (NC-1149)	1000	7.7	6.8	14.0	0.0	1.7	0.53	35	38	0.5	81	0	0
CRAWFORD CR	952	5.1	6.3	77.1	67.8	1.1	0.58	17	18	0.2	406	0	0
FISHHAWK CREEK (JEWEL)	3484	8.4	5.7	44.5	5.9	7.6	0.7	19	36	0.7	139	52	17
FISHHAWK CREEK (JEWEL)	843	3	20.7	22.4	4.6	0	0.3	18	57	1.4	305	122	0
FISHHAWK CREEK TRIB A	823	5.1	9.2	32.5	5.5	0	0.5	21	50	2.2	305	30	0
FISHHAWK CREEK TRIB A	1603	4.9	15.9	22.1	4.7	1.2	0.5	25	67	1.6	305	30	0
GILMORE CR	650	4.8	11.5	32.7	16.4	1.4	0.52	20	10	0	183	20	20
GILMORE CREEK	1616	5.8	4.2	72.4	44.1	2.8	0.45	28	19	0.2	207	0	0
GILMORE CREEK	700	3.9	32.3	12.7	0.0	0	0.21	41	23	0.1	366	0	0
GILMORE CREEK (NC-2154)	1004	10.7	8.7	34.3	28.3	0	0.35	24	28	0.3	61	0	0
GILMORE CREEK TRIB A	2001	5	7	89.2	84.6	2.4	0.55	27	23	0.2	134	0	0
GILMORE CREEK TRIB A	1022	3.6	16.5	24.9	0.0	0	0.27	37	28	0.2	625	46	0
HAMILTON CREEK	1095	10	3.6	50.1	4.6	3.3	0.5	13	15	0.3	91	0	0
HAMILTON CREEK	2540	7.5	6.2	29.4	3.0	1.4	0.5	15	22	0.3	326	60	12
HAMILTON CREEK	2019	5.8	7.6	17.7	0.3	0	0.4	23	31	0.8	229	48	24

Table 10-2. (cont) Upper Nehalem River Habitat Summaries by 5th Field HUC. Data obtained from Kavanagh et al. (2005).

ODF NEHALEM PROJECT AREA: HUC 1710020203
REACH SUMMARY

STREAM	REACH LENGTH (m)	ACTIVE CHANNEL WIDTH (m)	CHANNEL WIDTHS/ POOL	PERCENT POOLS	PERCENT SLACKWATER POOLS	POOLS >1m DEEP/km	RESIDUAL POOL DEPTH (m)	WOOD DEBRIS PIECES #/100m	WOOD DEBRIS VOLUME (m3)/100m	KEY PIECES #/100m	CONIFER TREES TOTAL/1000ft	RIPARIAN CONIFERS #>20in dbh /1000ft	RIPARIAN CONIFERS #>35in dbh /1000ft
HAMILTON CREEK TRIB A	783	7.4	4.6	30.3	1.5	1.2	0.5	18	32	0.1	0	0	0
HAMILTON CREEK TRIB A	1364	5.8	6.8	32.8	4.2	0.6	0.4	27	69	2.4	305	20	0
HAMILTON CREEK TRIB A	326	2.2	148.2	4.8	0.0	0	0.3	17	26	0.6	853	0	0
HAMILTON CREEK TRIB A1	1070	2.4	18.6	21.7	0.0	0	0.3	17	47	1.6	213	0	0
HAMILTON CREEK TRIB B	405	8.2	9.9	8.0	0.4	0	0.4	17	48	1	792	61	0
HAMILTON CREEK TRIB B	621	5.9	10.5	16.6	0.0	1.5	0.5	35	63	2.3	305	0	0
HAMILTON CREEK TRIB B	963	6.4	7.9	14.7	0.6	0	0.4	25	55	1.3	213	30	0
KLINES CREEK	2613	4.9	7.6	45.2	15.0	0.7	0.3	2	3	0.2	30	30	10
KLINES CREEK	3836	3.8	24.1	30.0	21.9	0	0.3	18	37	1.9	433	47	0
KLINES CREEK	1172	4.7	254	2.9	3.0	0	0.4	19	55	3.3	305	61	0
MOORES CREEK	1415	4.3	16.7	12.2	0.6	0	0.2	8	15	0.9	142	81	20
MOORES CREEK	2193	3.2	122.7	1.2	0.0	0	0.3	19	32	1	1097	30	0
NETTLE CREEK	395	4.1	20.5	13.4	0.0	0	0.28	9	4	0	61	61	0
NETTLE CREEK	297	4.1	6.5	6.5	0.0	0	0.23	32	23	0	91	61	0
NETTLE CREEK	734	3.4	27.5	2.2	0.0	0	0.28	38	31	0.8	366	61	0
NETTLE CREEK	1406	3.5	72.2	1.5	0.0	0	0.35	21	41	1	1768	305	122
NORTH FORK QUARTZ CREEK	1159	6.6	8.5	17.2	0.8	0.7	0.43	36	67	2.6	0	0	0
NORTH FORK WALKER CREEK	2063	5.4	22.4	6.1		0	0.3	35	82	1.3	739	8	8
OSWEG CREEK	520	1.8	83.9	1.4	0.3	0	0.15	29	81	3.1	284	81	0
OSWEG CREEK	1680	3.9	30.1	6.1	1.1	0	0.3	23	27	1	112	20	0
OSWEG CREEK	1028	2.1	0	0.0	0.0	0-	0	15	16	0.6	61	0	0
QUARTZ CREEK, SURVEYED AS NF	2090	12.6	8.9	6.8	0.0	1.3	0.5	20	14	0	406	0	0
QUARTZ CREEK, SURVEYED AS NF	995	12.3	6.8	6.9	0.0	2.8	0.52	34	36	0.7	30	30	0
QUARTZ CREEK, SURVEYED AS NF	572	8.5	5.9	25.9	0.0	11.7	0.92	51	60	0.7	122	0	0
SLAUGHTERS CREEK	548	3.4	9.6	28.5		0	0.2	30	76	3.6	30	30	0
SLAUGHTERS CREEK	594	3.1	7.9	34.5		0	0.2	30	63	1.5	447	122	20
SOUTH FORK QUARTZ CREEK	373	7.5	7.1	10.5	0.0	0	0.42	34	32	0.3	183	0	0
SOUTH FORK QUARTZ CREEK	870	3.7	17.3	16.0	0.1	1.1	0.55	5	2	0	183	0	0
SOUTH FORK WALKER CREEK	285	6	4.9	19.4	0.0	0	0.3	56	112	4.2	61	0	0
STANLEY CREEK	582	6.7	3.8	26.6	0.7	0	0.2	11	19	0.7	91	0	0
STANLEY CREEK	281	8.6	2.7	32.9	1.9	0	0.2	26	28	0.4	244	0	0
STANLEY CREEK	542	8.4	3.4	31.1	0.0	1.5	0.3	27	92	0.7	386	102	0
STANLEY CREEK	1466	7.1	4.3	25.7	0.5	0.6	0.3	40	67	1.2	549	61	0
STANLEY CREEK	519	6.3	4.3	22.4	0.2	0	0.3	43	54	1.3	152	0	0
TRAILOVER CREEK	2026	5.6	4	74.3	55.9	2.8	0.41	45	22	0.1	96	35	9
TRAILOVER CREEK	1425	4.9	300.1	2.8	2.8	0	0	43	57	1.7	163	18	0
TRAILOVER CREEK	2870	3.8	26	10.3		0		36	33	1	305	12	0
WALKER CREEK	8013	9.9	4.9	54.0	1.9	8.3	0.6	12	8	0	146	20	0
WALKER CREEK	2182	6.7	8.2	42.9	20.7	4	0.6	15	13	0.6	268	0	0
WALKER CREEK	2269	10	5.1	27.2	2.4	0.4	0.6	19	32	1.2	98	61	12
WALKER CREEK	270	10.5	4.3	44.8	0.0	0	0.5	13	12	0	305	244	0
WALKER CREEK	688	8.6	6	24.8	1.1	0	0.5	22	52	2.5	61	0	0
WALKER CREEK	2104	8.4	6.7	16.4	5.7	0.4	0.4	45	92	2.1	76	15	0
WALKER CREEK	1994	5	11	96.4	56.4	7.3	0.5	14	20	0.6	98	12	0
WALKER CREEK	3288	3.7	6.7	91.4	11.9	0.6	0.4	23	50	2	523	122	5
WALKER CREEK (NC-2130)	1009	4.6	7.7	93.8	72.5	7.9	0.67	11	9	0	81	0	0

Table 10-2. (cont) Upper Nehalem River Habitat Summaries by 5th Field HUC. Data obtained from Kavanagh et al. (2005).

ODF NEHALEM PROJECT AREA: HUC 1710020202
REACH SUMMARY

STREAM	SURVEY DATE	REACH LENGTH (m)	% AREA IN SIDE CHANNELS	GRADIENT	VWI	*VALLEY FORM	*CHANNEL FORM	*LAND USE DOM	*LAND USE SUB-DOM	SHADE %	BEDROCK %	FINES IN RIFFLES %	GRAVEL IN RIFFLES %	LARGE BOULDERS #/100m
COW CREEK	8/7/2000	2769	4.1	2.6	5.3	CT	CA	ST		92	14	16	26	3.3
COW CREEK	8/9/2000	2854	3.5	2.2	6.5	CT	CA	ST		87	4	49	41	0.1
COW CREEK	8/15/2000	783	1.0	13.4	1.3	SV	CH	ST		90	1	22	67	0.0
DEEP CREEK	8/8/1994	13932	0.3	0.4	17.8	CT	CT	YT	TH	87	5	45	46	0.3
DEEP CREEK	8/9/1994	4108	0.8	0.8	11.2	CT	CT	TH	MT	87	2	34	58	0.9
DEEP CREEK	8/15/1994	3599	0.9	0.9	8.5	CT	CT	TH	YT	86	17	33	48	2.4
DEEP CREEK	7/27/1999	1991	1.0	0.5	3.6	CT	CA	ST		85	21	23	33	0.7
DEEP CREEK	7/28/1999	472	0.8	0.9	1	OV	CH	ST		89	7	23	35	11.9
DEEP CREEK	7/28/1999	245	1.9	0.3	5	CT	CA	ST		90	1	35	40	0.0
DEEP CREEK (TRIB)	7/28/1999	310	4.0	0.5	3	CT	CA	ST		87	3	23	35	0.3
DEEP CREEK (TRIB)	7/29/1999	893	2.4	2.7	3	CT	CT	ST		91	12	21	35	0.0
DEEP CREEK (TRIB)	7/29/1999	385	1.6	3.8	1.3	MV	CH	ST		90	10	28	33	0.0
DEEP CREEK (TRIB)	9/9/1999	357	0.0	0.3	8	CT	CT	ST		92	0			0.0
DEEP CREEK SURVEYED AS TRIB A	9/13/1999	498	0.0	1.8	2.8	CT	CT	ST	YT	90	6	60	36	4.6
FISHHAWK CR (NC-2308)	9/8/2004	532	0.0	3.2	6.4	CT	CT	ST	YT	70	10	24	33	
FISHHAWK CREEK (ABOVE LAKE)	7/31/1996	2158	3.4	1.7	1.5	MV	CH	YT	ST	96	15	30	33	2.5
FISHHAWK CREEK (ABOVE LAKE)	8/1/1996	1576	4.8	0.3	3.8	CT	CT	ST		84	7	62	28	0.0
FISHHAWK CREEK (ABOVE LAKE)	8/28/1996	1422	4.0	2.3	3	MT	CA	YT		54	7	36	40	0.2
FISHHAWK CREEK (ABOVE LAKE)	8/28/1996	1035	5.9	4.3	1.6	MV	CH	YT	ST	69	3	33	50	3.0
LOUISGNONT CR	8/22/2000	877	0.9	0.6	4.5	CT	CT	ST	YT	94	2	38	47	0.0
LOUSIGNONT CREEK	8/16/2000	2605	3.8	1.5	4.7	CT	CT	YT	ST	90	4	22	60	0.1
LOUSIGNONT CREEK	8/23/2000	2202	5.6	5.8	8.4	CT	CT	YT	ST	93	7	13	26	0.0
LOUSIGNONT CREEK	8/29/2000	1166	2.8	7.7	4.4	CT	CT	YT	ST	92	3	62	34	0.3
NORTHRUP CR	9/10/2001	1090	7.8	1.3	5.4	MT	CA	ST		93	17	10	46	0.4
NORTHRUP CREEK	7/5/2000	831	5.3	0.8	12.9	CT	CT	ST		77	6	15	39	0.4
NORTHRUP CREEK	7/6/2000	4170	1.7	1.1	8.1	CT	CT	ST		74	9	26	59	0.8
NORTHRUP CREEK	7/18/2000	2440	8.6	1.6	4.9	CT	CA	ST		82	19	16	39	4.1
NORTHRUP CREEK	7/24/2000	3489	7.1	7.8	2	MV	CH	ST		86	9	20	41	2.4
NORTHRUP CREEK	7/31/2000	932	0.8	13.9	1.1	MV	CH	ST		98	10	19	26	1.3
NORTHRUP CREEK TRIBUTARY A	8/2/2000	2219	6.6	1.5	4.2	CT	CA	ST		83	3	24	58	1.8
NORTHRUP CREEK TRIBUTARY A	8/3/2000	556	3.3	27	2	MV	CH	ST		85	17	41	35	0.0
OAK RANCH CREEK	7/31/1995	2845	2.1	1.4	3.4	CT	CA	ST	TH	87	1	16	36	12.5
SAGER CR	8/9/2000	1073	5.4	3.2	1.3	OV	CH	ST		60	0	71	17	3.2
SAGER CREEK	9/14/1995	2625	0.0	0.8	2.4	CT	CT	LT	ST	84	5	64	23	2.4
SAGER CREEK	10/2/1995	3709	0.4	1.9	1.9	MV	CH	ST	YT	73	2	86	10	0.6
SAGER CREEK (NC-2365)	8/21/2003	1075	1.1	5.1	1.5	MV	CH	ST	TH	86	5	0	0	5.5
TRESTLE CREEK	8/14/1997	823	0.5	1.6	3.9	MT	US	LT		91	0	97	2	2.8
TRESTLE CREEK	8/14/1997	296	1.3	8.5	1	MV	CH	LT		94	0	65	30	0.0
WARNER CREEK	9/9/1996	827	3.9	2.7	4.8	CT	CA	YT	ST	87	16	17	46	3.3
WARNER CREEK	9/9/1996	606	4.5	2.2	1	MV	CH	YT	ST	82	8	43	43	4.5
WARNER CREEK	9/10/1996	1070	4.0	2	2.4	CT	CA	YT	ST	89	0	30	66	0.3
WARNER CREEK	9/10/1996	1282	2.7	5.1	1.2	MV	CH	ST	YT	91	1	28	58	1.3
WARNER CREEK TRIB A	9/12/1996	524	0.7	7.7	1.9	MV	CH	ST		92	16	20	30	3.1
WARNER CREEK TRIB B	9/11/1996	399	0.0	8.1	1	MV	CH	YT	ST	88	1	35	33	4.5
WARNER CREEK TRIB C	9/11/1996	226	0.0	13.3	1	MV	CH	YT	ST	75	1	34	52	0.0

Table 10-2. (cont) Upper Nehalem River Habitat Summaries by 5th Field HUC. Data obtained from Kavanagh et al. (2005).

ODF NEHALEM PROJECT AREA: HUC 1710020202
REACH SUMMARY

STREAM	REACH LENGTH (m)	ACTIVE CHANNEL WIDTH (m)	CHANNEL WIDTHS/ POOL	PERCENT POOLS	PERCENT SLACKWATER POOLS	POOLS >1m DEEP/km	RESIDUAL POOL DEPTH (m)	WOOD DEBRIS PIECES #/100m	WOOD DEBRIS VOLUME (m3)/100m	WOOD DEBRIS KEY PIECES #/100m	CONIFER TREES TOTAL/1000ft	RIPARIAN CONIFERS #>20in dbh /1000ft	RIPARIAN CONIFERS #>35in dbh /1000ft
COW CREEK	2769	6.7	6	30.2	1.0	0.3	0.43	25	27	1	163	20	10
COW CREEK	2854	4.7	14.1	44.5	0.8	0.3	0.49	38	65	2.6	61	20	0
COW CREEK	783	3	55.3	73.0	73.0	2.4	0.77	23	47	3.4	427	122	61
DEEP CREEK	13932	9.8	7.2	68.5	11.5	5.3	0.6	10	19	0.7	230	0	0
DEEP CREEK	4108	11	9.4	47.2	17.4	3.8	0.8	6	16	0.9	610	0	0
DEEP CREEK	3599	14.4	10.7	13.3	25.8	1.1	0.6	5	16	0.6	508	0	0
DEEP CREEK	1991	6.3	7.9	46.3	0.8	0	0.48	53	115	7.4	716	30	0
DEEP CREEK	472	7.5	4.2	66.0	0.9	0	0.39	77	192	9.5	853	183	0
DEEP CREEK	245	5.1	4.5	94.4	9.6	3.9	0.51	28	56	3.7	549	61	0
DEEP CREEK (TRIB)	310	5	2.6	82.7	2.0	0	0.43	62	116	5.2	61	0	0
DEEP CREEK (TRIB)	893	3.9	26.6	46.9	2.2	0	0.4	6	12	0.7	183	0	0
DEEP CREEK (TRIB)	385	2.8	7.8	71.6	5.0	5.2	0.5	65	155	9.9	427	0	0
DEEP CREEK (TRIB)	357	3.8	18.8	95.0	95.0	0	0.26	21	14	0.3	183	183	0
DEEP CREEK SURVEYED AS TRIB A	498	4.7	11.8	71.0	0.0	0	0.3	17	35	2.8	549	366	0
FISHHAWK CR (NC-2308)	532	5	5.1		16.6	0	0.31	21	22	0.6	264	81	0
FISHHAWK CREEK (ABOVE LAKE)	2158	9.2	4.4	58.5	2.9	9.5	0.8	36	59	1.9	61	30	15
FISHHAWK CREEK (ABOVE LAKE)	1576	6.2	5.9	71.8	10.8	14.6	0.8	14	21	0.8	122	30	0
FISHHAWK CREEK (ABOVE LAKE)	1422	8	3.6	66.4	46.2	4.5	0.5	31	56	3.4	533	46	0
FISHHAWK CREEK (ABOVE LAKE)	1035	5.8	4	47.0	7.9	0	0.4	33	106	5.7	508	61	41
LOUISGNONT CR	877	6.4	3.7	79.7	18.1	1.1	0.44	25	25	0.9	1630	20	20
LOUSIGNONT CREEK	2605	6.7	3.9	64.5	14.9	1.1	0.52	23	33	1.7	70	26	9
LOUSIGNONT CREEK	2202	4.1	20.1	13.8	0.7	0	0.35	23	39	2	122	61	0
LOUSIGNONT CREEK	1166	1.9	128.3	5.7	0.0	0	0.53	25	29	0.6	366	0	0
NORTHRUP CR	1090	10.5	3.1	69.9	13.7	0	0.41	20	7	0.1	0	0	0
NORTHRUP CREEK	831	12.3	2.2	63.8	1.1	12.8	0.68	21	20	0.7	0	0	0
NORTHRUP CREEK	4170	8.1	3.6	66.9	2.2	10.5	0.7	22	16	0.6	73	12	0
NORTHRUP CREEK	2440	8.7	5.4	29.7	1.1	0.3	0.47	29	27	0.4	0	0	0
NORTHRUP CREEK	3489	6.8	19.8	7.2	0.5	0.8	0.57	29	43	0.7	198	15	0
NORTHRUP CREEK	932	2.5	0	0.0	0.0	0	0	14	30	0.9			
NORTHRUP CREEK TRIBUTARY A	2219	4.7	13.2	28.7	10.7	0	0.45	28	53	2.3	61	20	0
NORTHRUP CREEK TRIBUTARY A	556	3.3	0	0.0	0.0	0.	0	34	34	0.2	488	0	0
OAK RANCH CREEK	2845	6.6	6.5	47.3	17.4	1.7	0.4	9	15	0.8	44	0	0
SAGER CR	1073	5.1	14.6	66.0	62.6	5.4	0.65	19	52	3.9	284	81	0
SAGER CREEK	2625	6.8	10.7	74.2	20.2	1.9	0.6	11	22	0.5	102	0	0
SAGER CREEK	3709	4.1	11.5	80.4	54.5	2.7	0.4	17	50	1.6	200	0	0
SAGER CREEK (NC-2365)	1075	4.2	29.1	17.7	3.6	0	0.45	17	35	0.7	325	20	20
TRESTLE CREEK	823	3.5	59.4	10.5	0.0	0	0.4	24	44	2.1	610	0	0
TRESTLE CREEK	296	2.3	0	0.0	0.0	0	0	32	80	3	0	0	0
WARNER CREEK	827	8.2	3.9	49.7	16.3	3.4	0.4	22	22	0.7	30	0	0
WARNER CREEK	606	7.6	4.4	39.7	0.2	3.1	0.6	46	44	1.7	152	0	0
WARNER CREEK	1070	6	5.1	50.3	9.4	2.6	0.6	28	25	0.5	274	0	0
WARNER CREEK	1282	5	7.1	31.9	0.6	0.7	0.5	37	42	1.5	203	0	0
WARNER CREEK TRIB A	524	4	8.7	22.3		0	0.4	31	34	0.8	427	0	0
WARNER CREEK TRIB B	399	4.3	13.3	13.5		0	0.4	35	60	3	61	0	0
WARNER CREEK TRIB C	226	2.3	19.7	20.2		0	0.4	64	103	6.6	183	0	0

Table 10-2. (cont) Upper Nehalem River Habitat Summaries by 5th Field HUC. Data obtained from Kavanagh et al. (2005).

ODF NEHALEM PROJECT AREA: HUC 1710020201
REACH SUMMARY

STREAM	SURVEY DATE	REACH LENGTH (m)	% AREA IN SIDE CHANNELS	GRADIENT	VWI	*VALLEY FORM	*CHANNEL FORM	*LAND USE DOM	*LAND USE SUB-DOM	SHADE %	BEDROCK %	FINES IN RIFFLES %	GRAVEL IN RIFFLES %	LARGE BOULDERS #/100m
BEAR CREEK	5/26/1997	853	2.2	1.9	4.5	MT	CA	ST		93	3	31	38	0.9
BEAR CREEK	5/26/1997	989	2.1	1.9	1.1	MV	CH	LT		92	6	56	32	1.2
BEAR CREEK	5/27/1997	822	1.0	2.6	2.7	MT	CA	ST	LT	88	5	67	31	0.6
CARLSON CREEK	8/29/1995	2968	0.1	2.8	1.8	OV	CH	ST	LT	87	2	60	20	0.5
CLEAR CREEK	7/7/1994	1691	4.1	2.4	5.6	CT	CA	TH	YT	90	0	55	35	0.1
DELL CREEK	7/11/1994	1302	3.8	1.7	2.4	OV	CH	ST		92	1	1	62	0.4
DELL CREEK	7/13/1994	457	1.8	2	5.8	MT	CT	ST		80	0	5	48	0.0
DERBY CREEK	9/22/1998	530	23.7	5.7	4.2	MT	US	ST	LT	90	0	33	26	149.6
LOUISIGNONT CREEK	8/18/1993	2600	9.7	0.9	8.1	CT	CA	LT	YT	93	6	32	58	1.1
LOUISIGNONT CREEK	8/24/1993	2911	19.4	1.7	4.9	MT	UA	LT	MT	98	0	37	49	0.0
LOUISIGNONT CREEK	8/26/1993	3420	7.4	4.8	1.7	SV	CH	LT	MT	97	6	40	38	4.8
LOUSIGNONT CR	6/30/1999	397	3.6	3.4	1.3	SV	CH	ST		79	0	44	29	0.0
LOUSIGNONT CREEK (NC-1268)	7/2/2002	442	10.3	6.1	3.9	MT	US	LT		90	0	10	48	0.7
N. FK. LOUSIGNONT CR (NC-1289)	8/12/2004	872		0.9	5.5	CT	CT	ST		76	0	63	35	
NORTH FORK ROCK CREEK	7/15/1993	1387	7.8	1.1	4.1	CT	CA	ST	ST	96		3	47	13.2
NORTH FORK ROCK CREEK	7/19/1993	1553	40.3	1	9.6	WF	US	ST	ST	94		9	50	4.0
NORTH FORK ROCK CREEK	7/21/1993	453	0.6	4.8	3.3	MV	CH	ST	ST	94		4	29	22.5
NORTH FORK WOLF CREEK	8/24/1992	1293	0.8	1.2	14.9	CT	CA	ST		87	29	24	43	3.9
NORTH FORK WOLF CREEK	8/24/1992	1514	1.3	1.7	2.6	SV	CH	ST		87	23	23	43	3.8
NORTH FORK WOLF CREEK	8/31/1992	1454	4.2	2.4	2	SV	CH	ST		87	13	26	65	2.7
NORTH FORK WOLF CREEK	9/1/1992	722	4.5	1.5	6.2	WF	US	ST		88	0	26	59	0.0
NORTH FORK WOLF CREEK	9/2/1992	1172	6.2	3.6	1.8	MV	CH	ST		98	2	44	46	1.3
OLSON CR (NC-1046)	9/1/2004	1053		0.8	2.1	MV	CH	ST		73	0	62	39	
ROCK CREEK	7/1/1993	582	6.8	0.6	3	CT	CT	TH	ST	99	7	8	32	75.4
ROCK CREEK	8/11/1993	669	4.4	2.9	1.5	MV	CH	ST		95	3	5	20	323.5
ROCK CREEK	8/12/1993	794	2.7	0.9	13.3	WF	US	ST		69	1	1	36	0.1
SOUTH FORK NEHALEM RIVER	9/12/1995	1396	2.3	4.3	1.3	MV	CA	ST	LT	94	1	30	47	3.8
SOUTH FORK NEHALEM RIVER	9/13/1995	1877	4.2	15	1.2	MV	CH	ST	LT	94	13	23	28	7.2
SOUTH FORK ROCK CREEK	8/3/1993	4670	1.8	2.3	12.1	MT	CT	ST	ST	95		2	35	14.9
SOUTH FORK ROCK CREEK	8/4/1993	188	0.0	7.5	1	SV	CH	ST	ST	99		0	67	58.5
SOUTH FORK ROCK CREEK	8/4/1993	490	0.0	3.1	7.8	CT	CT	ST	ST	97		4	66	0.8
SOUTH FORK ROCK CREEK	8/5/1993	2756	0.3	5.1	2.4	SV	CH	ST	TH	90		2	47	17.8
UPPER NEHALEM RIVER	8/31/1995	6079	4.5	2.3	2.6	CT	CA	LT		96	6	29	36	7.8
UPPER NEHALEM RIVER	9/11/1995	3517	3.1	9.1	1.9	MV	CH	LT		97	12	61	25	1.7
WOLF CREEK	7/15/1997	1690	5.0	3.5	1.2	MV	CH	LT		88	15	15	34	3.8
WOLF CREEK	7/15/1997	2455	2.2	6.3	1	SV	CH	MT		85	14	11	34	7.8
WOLF CREEK	7/16/1997	905	0.4	10.8	1	SV	CH	YT	LT	63	27	15	55	11.5

Table 10-2. (cont) Upper Nehalem River Habitat Summaries by 5th Field HUC. Data obtained from Kavanagh et al. (2005).

ODF NEHALEM PROJECT AREA: HUC 1710020201
REACH SUMMARY

STREAM	REACH LENGTH (m)	ACTIVE CHANNEL WIDTH (m)	CHANNEL WIDTHS/ POOL	PERCENT POOLS	PERCENT SLACKWATER POOLS	POOLS >1m DEEP/km	RESIDUAL POOL DEPTH (m)	WOOD DEBRIS PIECES #/100m	WOOD DEBRIS VOLUME (m3)/100m	KEY PIECES #/100m	CONIFER TREES TOTAL/1000ft	RIPARIAN CONIFERS #>20in dbh /1000ft	RIPARIAN CONIFERS #>35in dbh /1000ft
BEAR CREEK	853	5.8	7.7	47.2	8.5	5.6	0.6	35	28	0.8	213	0	0
BEAR CREEK	989	6.8	9.5	48.4	6.8	2.9	0.6	38	31	0.6	671	0	0
BEAR CREEK	822	2.5	10.4	89.4	88.3	3.3	0.5	31	22	0.5	396	30	0
CARLSON CREEK	2968	11.5	8.1	53.8	42.5	0.7	0.5	15	23	0.4	1240	203	20
CLEAR CREEK	1691	5.3	6.1	47.4	1.2	2.3	0.5	22	65	1.1	213	0	0
DELL CREEK	1302	5	5.5	60.3	12.8	0	0.4	44	34	0.5	290	12	0
DELL CREEK	457	2.9	16.5	18.5	6.5	0	0.4	32	28	0	701	0	0
DERBY CREEK	530	3.6	10	18.9	0.9	0	0.39	23	15	0.2	691	41	0
LOUISIGNONT CREEK	2600	10.3	3	65.4	2.0	2.5	0.6	23	16	0.2	260	30	0
LOUISIGNONT CREEK	2911	10	3	38.4	4.4	0.2	0.5	23	21	0.6	253	79	12
LOUISIGNONT CREEK	3420	6.9	6.8	25.8	0.6	0.9	0.4	41	59	1.5	441	121	0
LOUSIGNONT CR	397	3.7	8.3	15.3	2.5	0	0.43	39	82	4.3	1321	0	0
LOUSIGNONT CREEK (NC-1268)	442	4.7	5.4	16.6	0.8	0	0.3	23	29	0.5	325	122	0
N. FK. LOUSIGNONT CR (NC-1289)	872	7.3	5.2		87.2	0	0.41	20	17	0.7	467	41	0
NORTH FORK ROCK CREEK	1387	7.7	3.5	49.9			0.5	54	155		670	0	0
NORTH FORK ROCK CREEK	1553	3.5	7.9	59.8			0.4	39	78		483	0	0
NORTH FORK ROCK CREEK	453	3.5	10.8	25.9			0.4	51	91		1116	121	0
NORTH FORK WOLF CREEK	1293	9.1	3.8	61.8	9.3	3	0.4	7	7	0.2		0	0
NORTH FORK WOLF CREEK	1514	7.7	5.5	33.0	0.1	4.5	0.4	16	13	0.3		0	0
NORTH FORK WOLF CREEK	1454	6.7	5.4	46.0	0.2	2.5	0.5	29	29	1.5		0	0
NORTH FORK WOLF CREEK	722	4.3	6	55.9	0.7	0	0.5	22	44	2.8		0	0
NORTH FORK WOLF CREEK	1172	6.9	3.8	40.9	1.7	0.8	0.4	31	54	3.9		0	0
OLSON CR (NC-1046)	1053	10.1	7.5		88.2	1.9	0.48	21	33	0.6	1138	0	0
ROCK CREEK	582	17	8.6	9.8	1.2	3	0.6	6	12	0.4		0	0
ROCK CREEK	669	8.5	19.7	26.2	18.6	4.2	0.8	11	35	2.4	845	60	0
ROCK CREEK	794	8.2	9.7	38.6	10.5	7.8	1	9	14	0.4	0	0	0
SOUTH FORK NEHALEM RIVER	1396	9.6	15.1	12.1	0.0	1.4	0.7	28	38	0.7	610	122	0
SOUTH FORK NEHALEM RIVER	1877	11	89.9	1.2	0.0	0	0.4	23	44	0.9	549	122	0
SOUTH FORK ROCK CREEK	4670	7.1	8.3	27.6			0.6	20	28	·	338	48	0
SOUTH FORK ROCK CREEK	188	4	11.8	20.7			0.5	54	86		1448	241	0
SOUTH FORK ROCK CREEK	490	6.3	5.2	52.0			0.5	19	22		1207	91	30
SOUTH FORK ROCK CREEK	2756	4	19.1	14.8			0.4	31	65		748	133	42
UPPER NEHALEM RIVER	6079	14	9.5	15.8	0.0	2.9	0.7	15	18	0.4	315	91	0
UPPER NEHALEM RIVER	3517	10	34.4	17.7	3.3	0	0.5	26	59	2.2	549	213	30
WOLF CREEK	1690	7	11	16.3	1.3	4.7	0.7	30	16	0.1	366	0	0
WOLF CREEK	2455	6.9	24.4	8.2	0.6	0	0.5	22	28	0.9	701	0	0
WOLF CREEK	905	2.4	190.7	2.1	0.0	0	0.6	19	39	1.4	549	0	0

area, percent channel shading. According to Kavanagh et al (2005), dissimilarities between the upper Nehalem and reference conditions were evident for percent fine sediments and riparian attributes. The upper Nehalem streams had greater amount of fine sediments in riffle habitat compared to reference sites. Seventy five percent of the surveyed reaches had greater than 8 percent fines in riffle. With respect to the six wood attributes, the Nehalem streams were lower in terms of density of wood pieces, density of wood volume, key wood pieces, as well as in all three densities of riparian conifers. In addition, although channel shading in upper Nehalem was similar to reference stream condition this shading was provided by predominantly hardwood species as indicated by the lower number of large and very large riparian conifers in upper Nehalem reaches. The counts of large and very large riparian conifers were zero in 37 percent and 72 percent respectively of the upper Nehalem reaches surveyed. These findings are not surprising given that the Project area is managed for forestry where as the reference stream are located within unmanaged and relatively unimpacted systems.

When individual reach data were compared to reference conditions it was clear that there are reaches within these upper Nehalem streams that support excellent habitat conditions (Kavanagh et al. 2005). These reaches were identified by five or more attributes that were similar to or better than conditions in reference reaches. Table 10-3 identifies these reaches and their high quality habitat parameters by 5th Field HUC.

10.3.3 Fish Passage Barriers

Fish passage barriers at stream crossings were identified during 2005 road information management system (RIMS) surveys of all forest roads within the project area. Based on the RIMS database, a total of three passage barriers on known fish bearing streams exist in the project area as a result of road crossings. All three barriers were assessed to restrict passage of juvenile fish only. A description of fish barriers at stream crossings is provided in Section 8.2.5 and in Table 8-9.

10.3.4 Key Large Wood

Kavanagh et al. (2005) reported that large wood was relatively rare in upper Nehalem streams. According to the ODFW reference criteria, more than 3 pieces of large wood constitutes a high level, less than 0.5 pieces constitutes a low level, and from 0.51 to 2.9 pieces constitutes a moderate level. The data on large wood from Table 10-2 indicated that 61 percent of upper Nehalem surveyed stream reaches a moderate amount of key large wood. Twelve percent of the reaches had high levels of key large wood while 27 percent had low levels. It is important to not that the following streams had surveyed reaches that were lacking any key large wood: Cow Creek, Gilmore Creek, Nettle Creek (2 reaches), Osweg Creek, South Fork Quartz Creek, Walker Creek (3 reaches), Dell Creek. Table 10-4 denotes levels of key pieces of large wood for stream reaches by management basin.

Table 10-3. Excellent quality reach habitats within the upper Nehalem as defined in Kavanagh et al. (2005).

Management Basin	Stream Name	High quality habitat characteristics
Wheeler	South Fork Rock Creek	0% fines in riffles, >60% gravel in riffles, large wood >50 pieces/100m, >200 large riparian conifers
Sager	Deep Creek	~ 66% pools, large wood >75 pieces/100m, wood volume >192, ~9 key pieces large wood/ 100m, 183 large riparian conifers
	Tributary to Deep Creek	~72% pools, ~ 5% deep pools, large wood >65 pieces/100m, wood volume >155, ~10 key pieces large wood/ 100m, 183 large riparian conifers
Fishhawk	Fishhawk Creek	47% pools, ~ 8% deep pools, large wood >33 pieces/100m, wood volume >105, ~6 key pieces large wood/ 100m, ~6% secondary channel area
Beneke	Beneke Creek	large wood >29 pieces/100m, wood volume >79, ~4 key pieces large wood/ 100m, 168 large riparian conifers, ~6% secondary channel area
Buster	Buster Creek	8% fines in riffles, 60% gravel in riffles, ~ 50% pools, ~6% deep, 9% secondary channel area
	Buster Creek	7% fines in riffles, 78% gravel in riffles, ~ 76% pools, ~6% >23 pieces large wood/100 m, ~14% secondary channel area
	Buster Creek	57% gravel in riffles, ~ 62% pools, ~14% slack water, ~6% deep, 21 pieces large wood/100 m, ~9% secondary channel area
	Tributary to Buster Creek	73% pools, 73% slack water, >21% deep pools, large wood >45 pieces/100m, wood volume >259, ~5 key pieces large wood/ 100m,
	Cow Creek	67% gravel in riffles, 73% pools, 73% slack water, >22 pieces large wood, 3.4 key pieces large wood
	North Fork Rock Creek	3% fines in riffles, ~ 50% pools, large wood >50 pieces/100m and >154 volume, 7.8% area of secondary channels

Table 10-4. Streams with high, medium and low levels of key pieces of large wood. The number of reaches in parentheses for stream with more than one reach per category.

	Level of Key Pieces of Large Wood		
Management Basin	**High (>3 pieces/100 m)**	**Medium (0.6 – 3 pieces/100 m)**	**Low (<0.5 pieces/ 100 m)**
Wheeler		Bear Creek (2)	Bear Creek Carlson Creek
			Derby Creek
	Lousignont Creek	Lousignont Creek (2)	Lousignont Creek (2)
		N. Fork Lousignont Creek	
		S Fork Nehalem River	
		Upper Nehalem River	Upper Nehalem River
		Wolf Creek (2)	Wolf Creek
McGregor		Clear Creek	
	N. Fork Wolf Creek	N. Fork Wolf Creek	N. Fork Wolf Creek (2)
		Olson Creek	
		Rock Creek	Rock Creek (2)
Sager	Sager Creek	Sager Creek (3)	
	Deep Creek (3)	Deep Creek (3)	
	Deep Creek Tributary (2)	Deep Creek Tributary (2)	Deep Creek Tributary
	Slaughter's Creek	Slaughter's Creek	
Lousignot		Lousignot Creek	
Fishhawk	Fishhawk Creek (above lake) (2)	Fishhawk Creek (above lake) (2)	
		Fishhawk Creek	
	Trestle Creek	Trestle Creek (2)	
		Warner Creek (3)	Warner Creek
	Warner Creek Tributaries (3)	Warner Creek Tributary	
Northrup	Cow Creek	Cow Creek	
		Northrup Creek (4)	Northrup (2)
		Northrup Creek Tributary	Northrup Creek Tributary
Quartz		Quartz Creek 	 S. Fork Quartz Creek (2)
Buster		Buster Creek (6)	Buster Creek (6)
	Buster Creek Tributary	Buster Creek Tributaries (5)	Buster Creek Tributary
	Cow Creek	Cow Creek (2)	Cow Creek (2)
			Crawford Creek
	Klines Creek	Klines Creek (2)	Klines Creek
		Moores Creek (2)	
		Nettle Creek (2)	Nettle Creek (2)
	Osweg Creek	Osweg Creek (2)	

Table 10-4. Streams with high, medium and low levels of key pieces of large wood. The number of reaches in parentheses for stream with more than one reach per category.

	Level of Key Pieces of Large Wood		
Management Basin	**High (>3 pieces/100 m)**	**Medium (0.6 – 3 pieces/100 m)**	**Low (<0.5 pieces/ 100 m)**
		N. Fork Quartz Creek (2)	N. Fork Quartz Creek
		Stanley Creek (3)	Stanley Creek
	S. Fork Walker Creek		
Hamilton		Fishhawk Creek (Jewel) (2)	
		Fishhawk Creek Tributary (2)	
		Hamilton Creek Tributaries (6)	Hamilton Creek Tributary
		Hamilton Creek	Hamilton Creek (2)
Beneke	Beneke Creek (2)	Beneke Creek (7)	Beneke Creek (2)
		Bull Heifer Creek (3)	
		Bull Heifer Creek Tributary	
			Gilmore Creek (3)
			Gilmore Creek Tributary (2)
		Trailover (2)	Trailover
		N. Fork Walker Creek	
			S. Fork Walker Creek
		Walker Creek (6)	Walker Creek (2)
Wilark			Dell Creek
			Derby Creek
		Oak Ranch Creek	

10.3.5 Splash Dams

There is little documentation that splash damming occurred in and around the Project Area. The location of 11 permanent splash dams located in western Oregon rivers were documented in Hobbs et al. (2002). Three of these dams appeared to be in the upper Nehalem watershed, but there was insufficient detail to determine if they were located within the Project Area. In addition, no residual effects of splash dams were noted during ODFW Aquatic Inventory habitat surveys (Kavanagh et al. 2005).

10.3.6 Fish Habitat in Contiguous Lands

10.3.6.1 Clatskanie River Basin

Fish Species in the Upper Clatskanie River Basin.

Table 10-5 lists the fish species documented in the upper Nehalem River and their current management status. All of these species are native to the Oregon coastal rivers. Although additional resident and migratory fishes were undoubtedly present in the system, no documentation of those species was available. No information was available on introductions or presence of non-native species in the upper Clatskanie River, nor on their interactions with native species. No information was available to document the extirpation of any native fish species from the upper Clatskanie River basin.

Table 10-5. The management status of fish species distributed in the upper Clatskanie River within the Project area.

Species	Life histories strategy	Management Status
Coho salmon *Oncorhynchus kisutch*	Anadromous	Proposed as threatened under federal ESA as part of the Lower Columbia River ESU. State Endangered.
Chinook salmon *O. tshawytscha*	Anadromous, fall race	Listed as Threatened under federal ESA as part of the Lower Columbia River ESU. State sensitive species with critical status.
Steelhead *O. mykiss*	Anadromous, winter race	No special status
Coastal cutthroat trout *O. clarki clarki*	Anadromous and Resident	Federal species of Concern State sensitive with vulnerable status
Pacific lamprey *Lampetra tridentata*	Anadromous	Federal species of Concern State sensitive with vulnerable status
Western Brook lamprey *L. richardsoni*	Resident	No Special Status

The regional distribution, status and abundance of fish species is described in Section 10.3.1. The little information available that pertains specifically to these fishes in the Project Area is summarized below.

Coho salmon and winter steelhead have been observed spawning in the sections of the Little Clatskanie and Clatskanie rivers that flow through the Project area (Kavanagh et al. 2005). Coho salmon spawning was observed from mid November to early January while steelhead spawning was observed from mid-March to mid-April. Pacific lamprey have been observed in the Clatskanie River upstream of Carcus Creek (Kavanagh et al. 2005). Pacific lamprey redds were documented in April and May.

Oregon Department of Fish and Wildlife conducted spawning ground surveys for coho salmon in the Clatskanie River from 1948 to 1997. These data suggested that the abundance of spawning coho salmon decline considerably in the 1960s and 1970s (Rule 2001). Very few coho salmon are thought to return to the Clatskanie River today (Kavanagh et al. 2005). No population information was available for others fish species in the Clatskanie River basin Project Area.

Fish Habitat in the Upper Clatskanie River

Data on fish habitat in the Clatskanie River basin is presented in Rule (2001). This data was not presented in sufficient detail to separate out the reach that flows through ODF land. In general, the Clatskanie River habitat was rated good for pools, fair to poor for riffles, poor for large wood, poor for abundance of conifers and good for shade. Rule (2001) noted that the Clatskanie River had undesirably low levels of wood that there were few large riparian conifers, and that fine sediments were generally high within riffle habitats.

Fish Passage Barriers

Fish passage barriers at stream crossings were identified during 2005 road information management system (RIMS) surveys of all forest roads within the project area. Based on the RIMS database, no fish barriers existed on contiguous lands in the Upper Clatskanie River. A description of fish barriers at stream crossings is provided in Section 8.2.5 and in Table 8-9.

Key Large Wood

Data on key large wood is presented in Table 10-4.

Splash Dams

There is little documentation that splash damming occurred in and around the Project Area. The location of 11 permanent splash dams located in western Oregon rivers were documented in Hobbs et al. (2002). One of these dams appeared to be in the vicinity of the Clatskanie River, but there was insufficient detail to determine if it was located within the Project Area. In addition, no residual effects of splash dams were noted during ODFW Aquatic Inventory habitat surveys (Kavanagh et al. 2005).

10.3.6.2 Young's Bay Watershed

Fish Species in the Upper South Fork of the Klaskanine River

Due to the presence of a 25-foot waterfall on the lower South Fork of the Klaskanine River (E&S Environmental Chemistry and Young's Watershed Council 2000) no anadromous fish species are likely present in the Project Area. Based on their regional distribution, resident cutthroat trout and western brook lamprey most likely are present (Table 10-6). These species are native to the Oregon coastal rivers. Although additional resident and migratory fishes are undoubtedly present in the system. No documentation of those species was available. No information was available on introductions or presence of non-native species in the upper South Fork Klaskanine River, nor on their interactions with native species. No information was available to document the extirpation of any native fish species from the upper South Fork Klaskanine River basin.

Table 10-6. The management status of fish species distributed in the upper South Fork of the Klaskanine River within the Project area.

Species	Life Histories Strategy	Management Status
Coastal cutthroat trout *O. clarki clarki*	Anadromous and Resident	Federal species of Concern State sensitive with vulnerable status
Western Brook lamprey *L. richardsoni*	Resident	No Special Status

The ecology and regional distribution of the fish species present in the Project area are described in Section 10.3. No information was available that pertained specifically to these fishes in the Project Area.

Fish Habitat in the Upper South Fork of the Klaskanine River

No data were available on fish habitat in upper South Fork Klaskanine River within the Project Area. Oregon Department of Fish and Wildlife Aquatic inventory Habitat surveys were conducted in habitats downstream in the South Fork Klaskanine River in 1992 (E&S Environmental Chemistry 2000). The data from these surveys are summarized below. The South Fork Klaskanine survey reaches generally had moderate to good frequency of pools, moderate gravel in riffles, but lacked large wood both in terms of pieces and volume.

Fish Passage Barriers

Fish passage barriers at stream crossings were identified during 2005 road information management system (RIMS) surveys of all forest roads within the project area. Based on the

RIMS database, no fish barriers existed on known fish bearing streams in the Upper South Fork Klaskanine River as a result of road crossings. A description of fish barriers at stream crossings is provided in Section 8.2.5 and in Table 8-9.

Key Large Wood

No data were available on key pieces of large wood for the upper South Fork of the Klaskanine River within the Project Area. Data from habitat surveys downstream showed that all of the surveyed reaches in the South Fork completely lacked key pieces of large wood (E&S Environmental Chemistry 2000).

Splash Dams

Although there is some documentation that splash damming occurred in and around the Project Area historically, no documentation of splash dams in the South Fork Klaskanine River was found.

10.4 AMPHIBIANS IN THE UPPER NEHALEM RIVER

10.4.1 Columbia Torrent Salamander

10.4.1.1 Species Distribution and Status

The Columbia torrent salamander is one of four species (*Rhyacotriton olympicus, R. cascadae, R. variegatus*, and *R. kezeri*) in the genus Rhyacotriton. Until 1992, the genus was considered to be a single species, all of which were formally known as *R. olympicus*. The geographic ranges of the four species are almost entirely isolated from one another—the single exception being a possible area of overlapping ranges of *R. kezeri* and *R. variegatus* in southern Tillamook County, Oregon (Csuti et al. 1997). The Columbia torrent salamander occurs north of the Little Nestucca River and south of the Chehalis River in the Coast Range of Oregon and Washington (Good and Wake 1992).

The Columbia torrent salamander (*R. kezeri*), also commonly known as the Columbia seep salamander, is classified by the Oregon Department of Fish and Wildlife (ODFW) as "Sensitive-Critical." The species has Natural Heritage Network ranks of Global-3 and State-3 (ORNIC 2004).

10.4.1.2 Natural History

The four species of *Rhyacotriton* are morphologically very similar, but can be differentiated based on pigmentation features, minor variation among some life history characteristics (Good and Wake 1992), and genetics (Good et al. 1987). There is apparently little variation in habitat selection among the four species of *Rhyacotriton* (Good and Wake 1992).

Torrent salamanders are usually found along the wetted edge of steep streams, seeps, and waterfall splash zones. Diller and Wallace (1996) reported that the average slope of stream reaches occupied by torrent salamanders was 17.6 percent. Torrent salamanders prefer cold environments and begin to exhibit signs of stress at relatively low temperatures (63°F) compared to other salamanders (Brattstrom 1963). The highest abundances of torrent salamanders are observed in water temperatures of 46.4-55.4°F (Welsh and Lind 1996). Adult torrent salamanders are occasionally found in moist, riparian environments as well. However, they are extremely vulnerable to desiccation in terrestrial environments. Ray (1958) demonstrated experimentally that torrent salamanders become physically incapacitated when subjected to more than a 7.4 percent loss of body water, a much lower threshold for water loss than any other salamander tested. Not surprisingly, torrent salamanders are only able to persist out of water in closed-canopy forests (Good and Wake 1992). Welsh and Lind (1996) suggested that torrent salamanders are dependent on the microclimate and habitat structure associated with late-successional forests. Diller and Wallace (1996) concluded that highly suitable microhabitats are most likely to exist in late-successional forests, but torrent salamanders are widespread in other habitat types.

Given its low tolerance for warm, dry environments, it would seem likely that torrent salamanders would prefer sites on northerly aspects. Diller and Wallace (1996) found evidence that torrent salamanders were more likely to occur in streams on northern slopes than other aspects when aspect measurements were averaged at a landscape-scale using a geographic information system (GIS). But the same study failed to produce evidence of habitat selection for aspect at a microsite scale (i.e., measured at the point of capture). This is not particularly surprising because stream water temperature (and presumably torrent salamander abundance) is more strongly affected by upstream conditions than aspect or other conditions at the point of temperature measurement. Another California study (Welsh and Lind 1996) tested, but failed to find a significant association between torrent salamander abundance and landscape-scale aspect.

Torrent salamanders reportedly are most abundant in streambed substrates composed of coarse gravel and cobble (Good and Wake 1992; Diller and Wallace 1996; Welsh and Lind 1996). The interstitial spaces among streambed particles are used as oviposition sites and hiding cover by adults and larvae. Good and Wake (1992) report that adult salamanders tend to be found among rocks, while larvae tend to use coarse gravel. Welsh and Lind (1996) suggest that stream reaches having a variety of particle sizes provides the most suitable torrent salamander habitat for hiding, feeding, and reproduction. However, habitat is degraded where interstitial spaces become filled with sand or fine sediment. Lowell and Diller (1996) found that consolidated geological formations (vs. unconsolidated sedimentary formations) and stream gradient were among the best predictors of torrent salamander occurrence. The authors believed the relationship could be explained by the relatively large streambed particles that result from the decomposition of consolidated bedrock, and the downstream transport of fine particles caused by fast water moving down steep slopes.

10.4.2 Tailed Frog

10.4.2.1 Species Distribution and Status

In Oregon, tailed frogs are distributed throughout the Coast Range, Siskiyou region, western Cascades, and the Blue Mountains (Csuti et al. 1997).

The tailed frog (*Ascaphus truei*) is classified by ODFW as "Sensitive-Vulnerable" and has Natural Heritage Network ranks of Global-4 and State-3 (ORNIC 2004). The U.S. Fish and Wildlife Service (USFWS) considers the tailed frog a Species of Concern in Oregon (USFWS 2004). Neither the torrent salamander nor tailed frog has been determined to be Threatened or Endangered under the federal Endangered Species Act.

10.4.2.2 Life History

Tailed frogs are almost always associated with cold, mountain streams. Unlike most other frogs in the Pacific Northwest, the species does not use lakes or wetlands. deVlaming and Bury (1970) reported that first year tailed frog tadpoles tend to prefer water temperatures $<50°F$, while older tadpoles prefer temperatures 50-71.6°F. In a stream amphibian survey conducted in the Kilchis River basin (Tillamook Co., OR), water temperatures where tailed frogs were captured averaged 52.2°F (Pacific Wildlife Research, unpublished data).

Tailed frogs appear to select microhabitats depending upon their developmental stage. Adult frogs and more mature larvae tend to occur more often upstream, in steeper and faster waters than less developed larvae (Hayes et al. 2003; Wahbe and Bunnell 2003). Hayes et al. (2003) hypothesize that adult tailed frogs lay eggs in lower reaches where they are more likely to remain submerged during low flow. As larvae mature, they may move upstream to reaches that are unoccupied by fish, which are significant predators of tailed frogs.

Adult tailed frogs are also found outside of stream channels in riparian and upslope forests (Gomez and Anthony 1996; McComb et al. 1993). However, research on tailed frogs does not clearly describe a relationship between forest conditions and tailed frog occurrence or abundance. Blaustein et al. (1995) suggested that tailed frogs are among the amphibian species most sensitive to the loss of old-growth forests in the Pacific Northwest. Furthermore, Gomez and Anthony (1993) found tailed frogs to be more abundant in large conifer and old-growth forests than in younger forest types in the Oregon Coast Range. In contrast, Bull and Carter (1996) did not find evidence of a relationship between tailed frog abundance and timber harvest intensity in northeastern Oregon. Wahbe and Bunnell (2003) concluded tailed frog abundance was more strongly affected by stream microhabitat features than the logging history of a site.

Cobbles and large rocks in stream channels are important habitat elements for tailed frogs. Tailed frog tadpoles use a specialized oral disk to attach themselves to cobbles and boulders while feeding on diatoms and periphyton (Altig and Brodie 1972; Bull and Carter 1996). The interstitial spaces between rocks are used as oviposition sites and as hiding cover by tadpoles and adults.

10.4.3 Population Distributions in the Nehalem Watershed

The Project Area is within the reported geographic ranges of the Columbia torrent salamander and the tailed frog (Csuti et al. 1997; Corkran and Thoms 1996). A review of scientific literature, state and federal agency reports, and watershed analyses for the Nehalem River basin revealed just one stream amphibian survey conducted in the Project Area. Researchers from Oregon State University Department of Forest Science collected data on stream amphibians in Buster Creek, a tributary to the Nehalem River, in 2004 as part of amphibian monitoring methods study (Hayes and Stoddard 2004). These researchers found both torrent salamanders and tailed frogs present in Buster Creek. Tailed frogs have also been observed to the south of the Nehalem watershed during fish surveys in the Miami River and tributaries (D. Plawman, ODFW, pers. comm.) and both amphibian species were found to be widespread during a 1998 stream amphibian survey in the Kilchis River watershed (Pacific Wildlife Research, unpublished data). To better understand the distribution of the two focal species, the Columbia torrent salamander and coastal tailed frog for this 2005 Watershed Analysis, an extensive reconnaissance survey was conducted across Oregon state forestlands within the upper Nehalem watershed.

10.4.3.1 Survey and Analytical Methods

Prior to fieldwork, potential survey sites were selected in the watershed using a GIS and spatially-explicit data from ODF (GIS coverages on management basin boundaries, streams, and roads). The selection of particular sites was guided by three principles:

- The number of survey sites allocated to a single ODF management basin was approximately proportional to the land area of the management basin relative to the total land area of all ODF state forestlands in the watershed.
- Approximately 75 percent of the survey sites were to be allocated to streams categorized as "Small" on the ODF streams coverage so as to focus most of the sampling effort in headwater streams where torrent salamanders and tailed frogs tend to be most numerous. The remainder of the sites were allocated to streams categorized as "Medium." Tailed frogs (particularly the larval stage) are known to occur in these mid-order streams and torrent salamanders are sometimes detected in springs and seeps associated with these larger streams.
- Survey sites were located within 200 m of road crossings to minimize walk-in times to the sites, thus maximizing the time available for amphibian searches. All ODF management basins in the watershed are well-roaded and no gaps in coverage were apparent during the GIS survey site selection process.

Based on these selection principles, 100 potential locations were identified and their latitude/longitude coordinates loaded into a GPS for the amphibian surveyor.

Amphibian surveys were conducted from August 16 to August 26, 2005. Searches were conducted by a single surveyor along a 20-m stream transect located at each site. As the surveyor approached each transect, he was observant for adult tailed frogs along the stream margins. The wetted channel was then searched systematically from the downstream end, working upstream. Amphibians were captured in riffles and slides by holding a bait net 200-500 cm downstream of rocks that were overturned by the surveyor, allowing the current to sweep amphibians, fish, and invertebrates into the net. Pools and shallows were searched by visual inspection. Seeps and springs flowing into the main channel were carefully searched for torrent salamanders. Each survey site was searched for a total of 15 minutes. All captured amphibians were released on the transect following the search. Habitat characteristics were recorded at many of the transects visited during the survey. Measurements included stream temperature, active channel width, and a classification of dominant and secondary substrate size classes (silt, sand, gravel, cobble, boulders, or bedrock) on the transect. A digital photograph was also taken of most transects.

A number of survey sites selected prior to fieldwork were inaccessible due to logging or road construction, had no wetted channel when they were visited, or were erroneously selected (no stream channel at the GPS coordinates). Most of these survey sits were replaced by other streams found during the course of fieldwork in the same management basin. However, extensive road building and logging activities occurring prevented the surveyor from reaching many of the major streams in Fishhawk, Louisignot and Northrup Basins.

Because each transect was searched for amphibians only briefly, it is likely that many torrent salamanders and tailed frogs went undetected on transects having suitable habitat. To better understand which transects have conditions favorable for torrent salamanders and tailed frogs, habitat characteristics summarized from sites where each species was detected were reviewed and formulated into simple habitat mapping rules. These rules were implemented as GIS query statements to identify transects having suitable habitat attributes, and where each species would be most likely to occur, even if they were undetected during this reconnaissance survey. The mapping rule used to identify transects that have suitable habitat for torrent salamander is as follows:

Habitat: Stream Temp <10C° and Dominant Substrate = "Cobble" or "Gravel"

The stream temperature criterion (<10.3C°) was set to include streams within one standard deviation of the mean temperature recorded at transects where torrent salamanders were detected. Observations from the survey, as well as research studies, indicate that the species most often inhabits coarse gravel and cobble substrates.

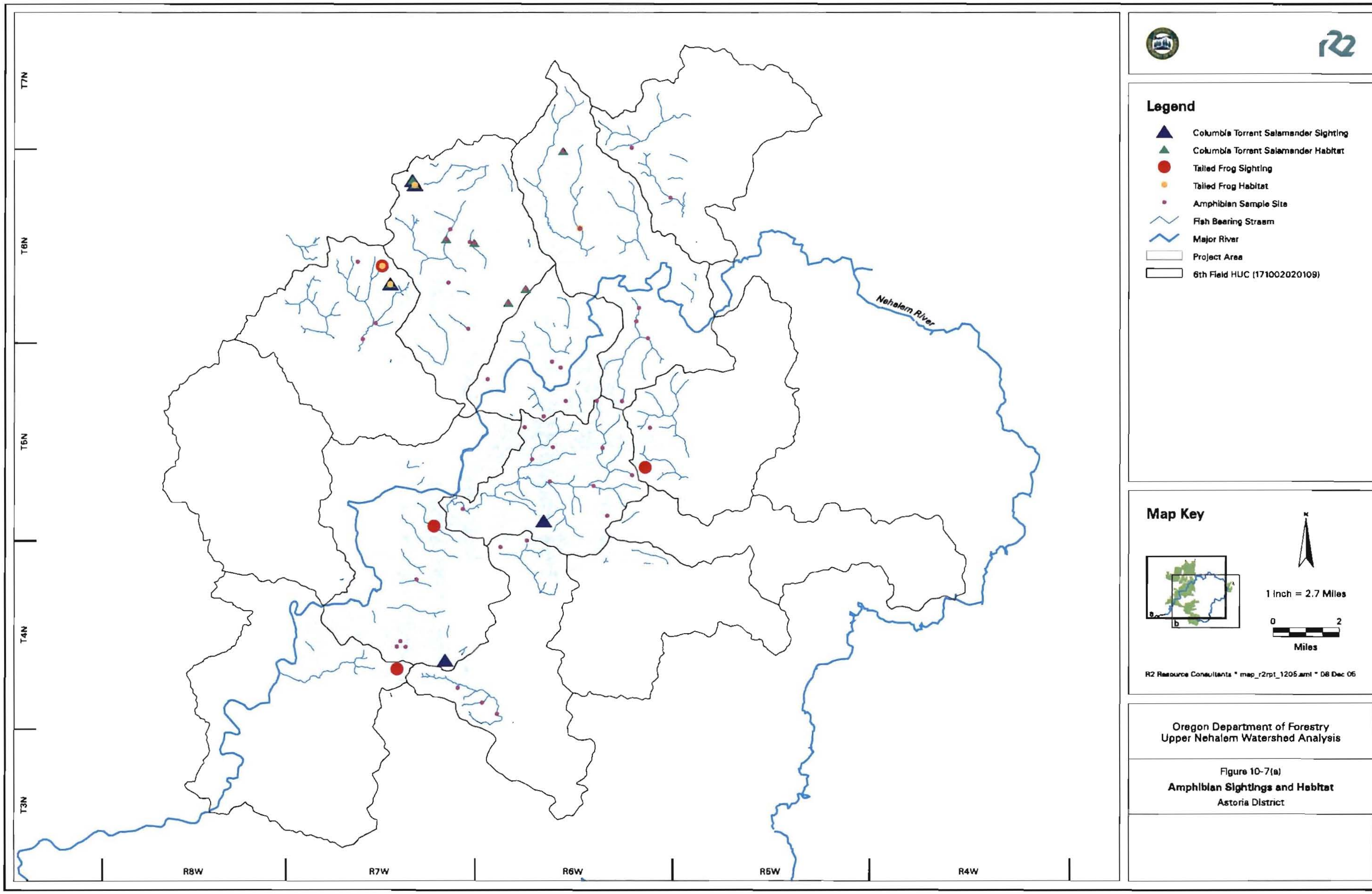
The mapping rule used to identify transects that have suitable habitat for tailed frogs is as follows:

Habitat: Stream Temp <12.7 and Dominant Substrate = "Cobble"

Similar to the torrent salamander rule, the tailed frog rule is based on the assumption that stream temperature and streambed substrate composition are the most limiting factors to tailed frog populations. Both rules were used to filter out records from the survey GIS database and identify transects that are potentially suitable habitat for the two focal species.

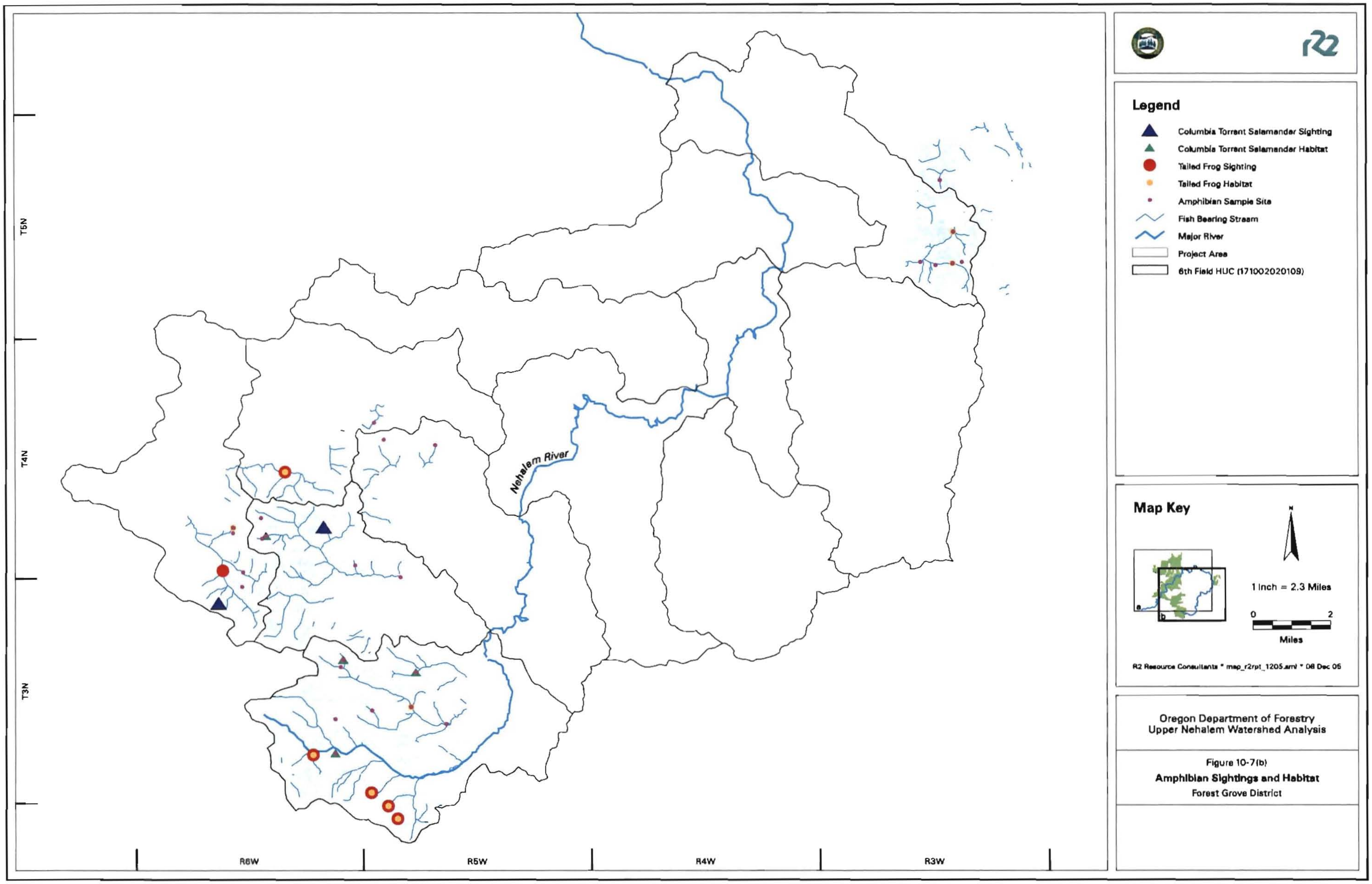
10.4.4 Results

Ninety-one different sites were sampled during the course of the survey. Columbia torrent salamanders were detected at eight sites and coastal tailed frogs were detected at 10 sites (Figure 10-7a,b). Other amphibians observed during the survey included Cope's giant salamander, (*Dicamptodon copei*), Pacific giant salamander (*Dicamptodon tenebrosus*), rough-skinned newt (Taricha granulosa), Pacific treefrog (*Hyla regilla*), and red-legged frog (*Rana aurora*).



Oregon Department of Forestry
Upper Nehalem Watershed Analysis

Figure 10-7(a)
Amphibian Sightings and Habitat
Astoria District



T5N
T4N
T3N
R6W
R5W
R4W
R3W
Nehalem River
r2
Legend
Columbia Torrent Salamander Sighting
Columbia Torrent Salamander Habitat
Tailed Frog Sighting
Tailed Frog Habitat
Amphibian Sample Site
Fish Bearing Stream
Major River
Project Area
6th Field HUC (171002020109)
Map Key
1 inch = 2.3 Miles
0
2
Miles
R2 Resource Consultants * map_r2rpt_1205.aml * 08 Dec 05
Oregon Department of Forestry
Upper Nehalem Watershed Analysis
Figure 10-7(b)
Amphibian Sightings and Habitat
Forest Grove District

Table 10-7 summarizes habitat characteristics at sites where torrent salamanders and tailed frogs were detected, and among all sites where habitat data were collected. These results indicate that Columbia torrent salamanders were most often found in the coldest streams of the watershed. The species was usually detected in small, headwater streams where streambed substrates were dominated by cobble (diameter 2.5-10.0 in.). However, the surveyor noted that torrent salamanders were most often uncovered in small deposits of gravel (diameter 3/4-2.5 in.) imbedded among the cobbles. Using a GIS mapping rule based on habitat measurement and observations made during the survey, a total of 13 transects visited during the survey were determined to have suitable habitat for torrent salamanders. Eight our of 11 ODF management basins in the analysis area had at least one transect having suitable conditions for torrent salamanders (Figure 10-7a,b).

Table 10-7. A comparison of stream habitat characteristics measured or observed at sites where Columbia torrent salamanders and coastal tailed frogs were detected, and among all sites visited during the survey

Measurement/ Classification	Torrent Salamander Sites	Tailed Frog Sites	All Survey Sites
Number of sites	8	10	91
Mean (standard deviation) stream temperature, C°	9.1 (1.2)	11.6 (1.1)	11.9 (1.9)
Maximum stream temperature, C°	11.0	13.0	16.7
Mean active channel width, meters	1.3	1.9	2.4
Most frequent dominant substrate class	Cobble	Cobble	Cobble
Most frequent secondary substrate class	Cobble	Cobble	Gravel

Tailed frogs were typically found in larger and warmer streams than torrent salamanders, but were excluded from streams where water temperatures exceeded 13.0C° (Table 10-7). Adult and larval tailed frogs were only found in streams where substrates were dominated by cobbles. Using the tailed frog habitat mapping rule, a total of 13 transects visited during the survey were determined to have suitable habitat for the species. Eight our of 11 ODF management basins in the analysis area had at least one transect having suitable conditions for tailed frogs (Figure 10-7a,b).

10.5 CONCLUSIONS

The findings of this reconnaissance survey indicate that torrent salamanders and tailed frogs occur in most of ODF management basins within the Nehalem watershed. Habitat data collected at transects occupied by torrent salamanders and tailed frogs supported results of earlier research studies showing that the two species are most frequently found in streams having coarse streambed substrates and cold water temperatures.

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