CHAPTER 3. AFFECTED ENVIRONMENT

This Chapter summarizes the physical, biological, and social environments of an area that are subject to change directly, indirectly, or cumulatively as a result of the proposed action or the alternatives. For several resources, the geographic area or scale considered in the analysis is defined. This will determine the actions, or type of actions that would be relevant to consider in the analysis of cumulative effects.

Past, ongoing, and reasonably foreseeable future actions, types of actions, and their relative locations that are considered in **Chapter 4, Environmental Consequences**, are found in Table 3-20, located at the end of this chapter.

Hemlock Dam is located on Trout Creek, a major tributary to the Wind River. The Wind River enters the Columbia River near Carson, Washington, approximately 10 miles upstream of Bonneville Dam (Figure 3-1).

This analysis discusses conditions and effects at a range of scales from the site scale to the subwatershed scale (i.e. Trout Creek 6th field subwatershed), to the watershed scale that includes the entire Wind River (5th field) watershed. The Wind River is identified as watershed number 1707010512.

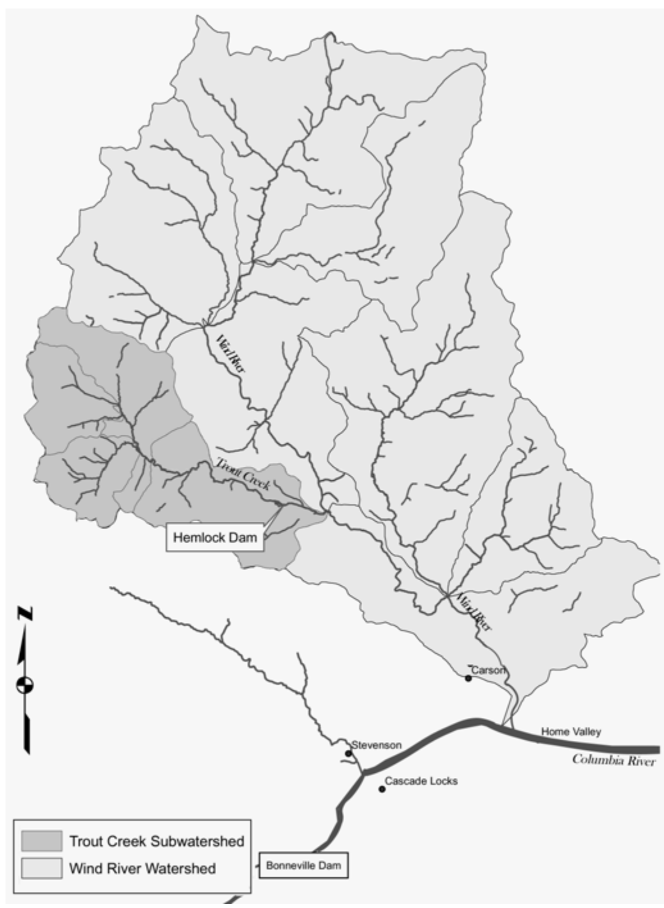

Figure 3-1. Location of Hemlock Dam within the Trout Creek subwatershed of the Wind River watershed.

3.1. Aquatics – Hydrology

3.1.1. Streamflow

3.1.1.1. Watershed-Scale Conditions

The Wind River watershed has a temperate marine climate with cool, moist winters and dry summers. Mean annual precipitation is 110 inches as measured at the Wind River Nursery located in the Trout Creek subwatershed near Hemlock Lake. Annual precipitation ranges from less than 60 inches per year in the southeast portion of the watershed to over 120 inches per year in the west and northwest. Approximately 75% of the annual precipitation falls between November and March.

With elevations ranging from less than 100 feet to nearly 4,000 feet, both rain and snow are common in the watershed during the winter months. Average daily flows are greatest during the winter, peaking in January at a mean of 2,168 cubic feet per second (cfs). The largest peak flows similarly occur in winter, often in response to a combination of rainfall and snowmelt during warm, marine-influenced storms. The peak flow of record on the Wind River occurred on February 8, 1996 when discharge reached 53,600 cfs at the U.S. Geological Survey (USGS) gauge near Carson. The USGS estimated the recurrence interval for a flood of this magnitude to be in the neighborhood of 125 years on the Wind River. Summer flows on the river are typically lowest in September when average daily discharge drops to a mean of 236 cfs. The source of summer flows in the Wind River and Trout Creek include subsurface recharge and water stored in the wetlands, wet meadows and other retention areas of the watershed.

3.1.1.2. Subwatershed-Scale Conditions

Mean annual discharge on Trout Creek is 250 cfs. Discharge levels commonly range from less than 20 cfs during the lowest flows of late summer months, to over 2,000 cfs during bankfull floods that occur during winter runoff (Figure 3-2). Monthly mean discharges for the period of 1945 – 1948 are shown in Table 3-1, and range from a low of 13.2 cfs in August to a high of 385 in November.

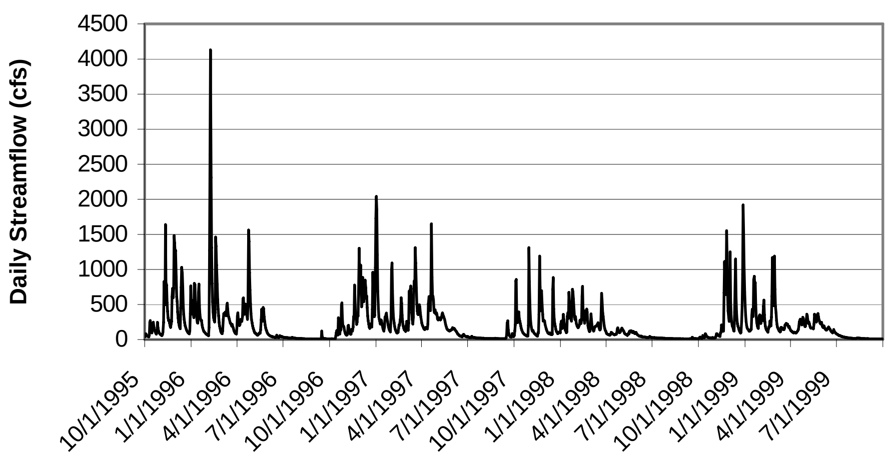

Figure 3-2. Daily stream flows on Trout Creek below the Flats, from October, 1995 through September, 1999.

Table 3-1. Mean monthly discharge (in cfs) on Trout Creek near Hemlock, 1945 – 1948.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean of monthly stream flows 1945 – 1948	363	342	261	285	246	96	43	13	19	164	385	356

In August of 1992, one of the lowest water years in the recent past, discharge on Trout Creek was measured at less than five cfs at the USFS baseline monitoring station on lower Trout Creek (just upstream of Hemlock Lake). The largest flood recorded on Trout Creek occurred in February 1996 and measured 5,660 cfs just downstream of the confluence of Layout Creek with Trout Creek. A flood of this magnitude is an infrequent occurrence on Trout Creek and would be expected to occur on average only once every 100 years or more.

3.1.1.3. Local Scale

Water levels and velocities change throughout the year at Hemlock Lake as a function of both natural discharge fluctuations in Trout Creek and management of the flashboards on Hemlock Dam. During winter months the flashboards are typically removed or limited to just the outer edges of the dam (to force flows over the center of the dam crest). During the summer (typically beginning in June) the flashboards are installed across the dam crest and the lake is backed up for summer recreational use. The flashboards increase the lake level by approximately four feet. Since closure of the Wind River Nursery there have been no irrigation needs or other water withdrawals occurring at Hemlock Lake, therefore Trout Creek essentially passes directly through the lake with minor additions of flow from direct tributaries to the lake and losses to infiltration and evaporation.

3.1.2. Channels/Sediment

3.1.2.1. Watershed-Scale Conditions

The Wind River begins in McClellan Meadows, at an elevation of approximately 3,000 feet. It is a fifth order stream that drains an area of approximately 225 square miles (Figure 3-3). From the headwaters to its mouth on the Columbia River, the Wind River travels over 31 miles and drops nearly 3,000 feet in elevation. Joined by a series of high gradient tributaries, the Wind River flows through a narrow valley from near Paradise Creek to the confluence with Falls Creek. Gradients drop from over 15% near the headwaters to near two percent at the mouth of Falls Creek. As the river flows through the middle reaches from Trapper Creek to the community of Stabler, the valley width increases and channel gradients continue to drop. Near Stabler the river enters a bedrock-confined channel and gradients increase as the river begins a steep descent of over ten miles to the mouth on the Columbia River. Trout Creek enters the Wind River near the upper end of this canyon.

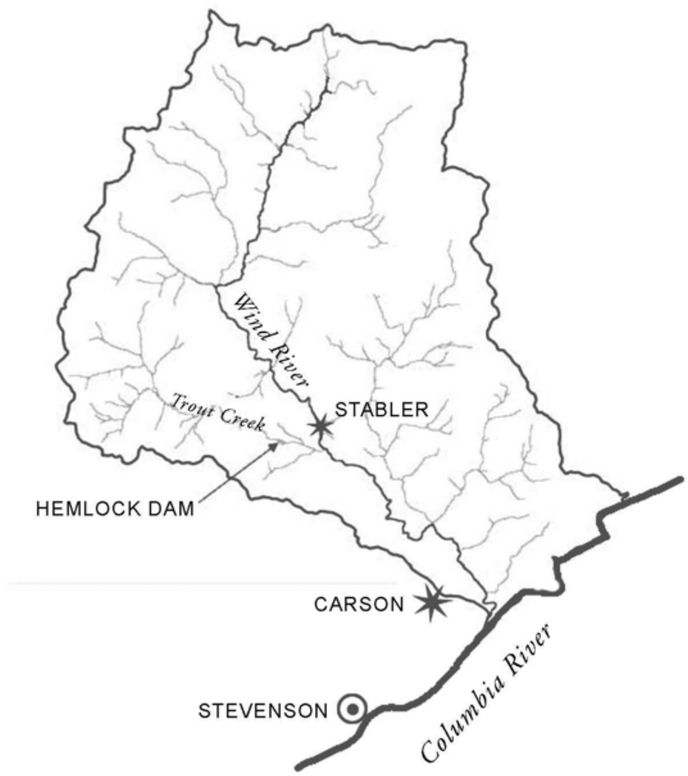

Figure 3-3. Wind River watershed and location of Hemlock Dam on Trout Creek.

At the lower end of the canyon the Wind River again broadens out as it approaches the Columbia River and becomes influenced by backwater from the Bonneville pool (the body of water impounded by Bonneville Dam on the Columbia River). The Wind River expands to a maximum width of 1,100 feet as it enters the Columbia River. The mouth of the Wind River is considered the area influenced by the backwater of the Columbia River and upstream of the Highway 14 Bridge. As the river passes under Highway 14 the width is restricted to approximately 200 feet. A rough bathymetry of the mouth area on the Wind River was performed by the Bureau of Reclamation (USDI) in 2004 and is shown in Figure 3-4. Average depth in the 37-acre mouth area was 6 feet (USDI 2004a).

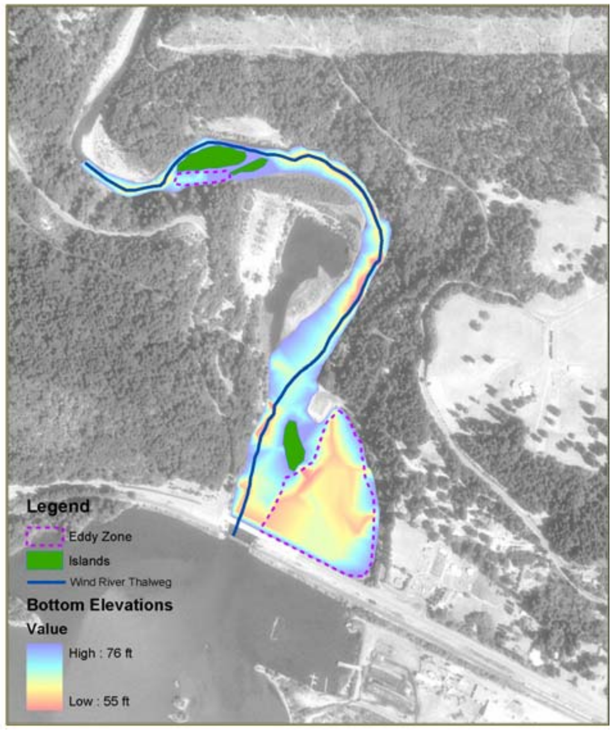

Figure 3-4. Mouth of the Wind River with general bathymetry.

3.1.2.2. Subwatershed-Scale Conditions

The Trout Creek subwatershed ranges in elevation from approximately 850 feet at the mouth of Trout Creek to over 3,800 feet at the upper northwestern boundary of the subwatershed. Trout Creek Hill and Bunker Hill, two past active volcanic vents, form portions of the eastern boundary and a lava flow from the upper northern slopes of the drainage further emphasizes the volcanic history of the area.

For characterization purposes, the Trout Creek subwatershed can be roughly broken into an upper and lower drainage (Figure 3-5). The upper drainage is a bowl-shaped catchment rimmed on the west and north by a high ridge and steep, dissected slopes associated with Cougar Rock, Twin Rocks, West Crater, and Soda Peaks. To the east the upper drainage is bounded principally by Trout Creek Hill and its flanks, which have poorly developed drainage patterns. At the base of the slopes and near the center of the upper drainage is Trout Creek flats , a broad, alluvial valley bottom characterized by a series of wetlands, beaver ponds, and broad meandering stream channels.

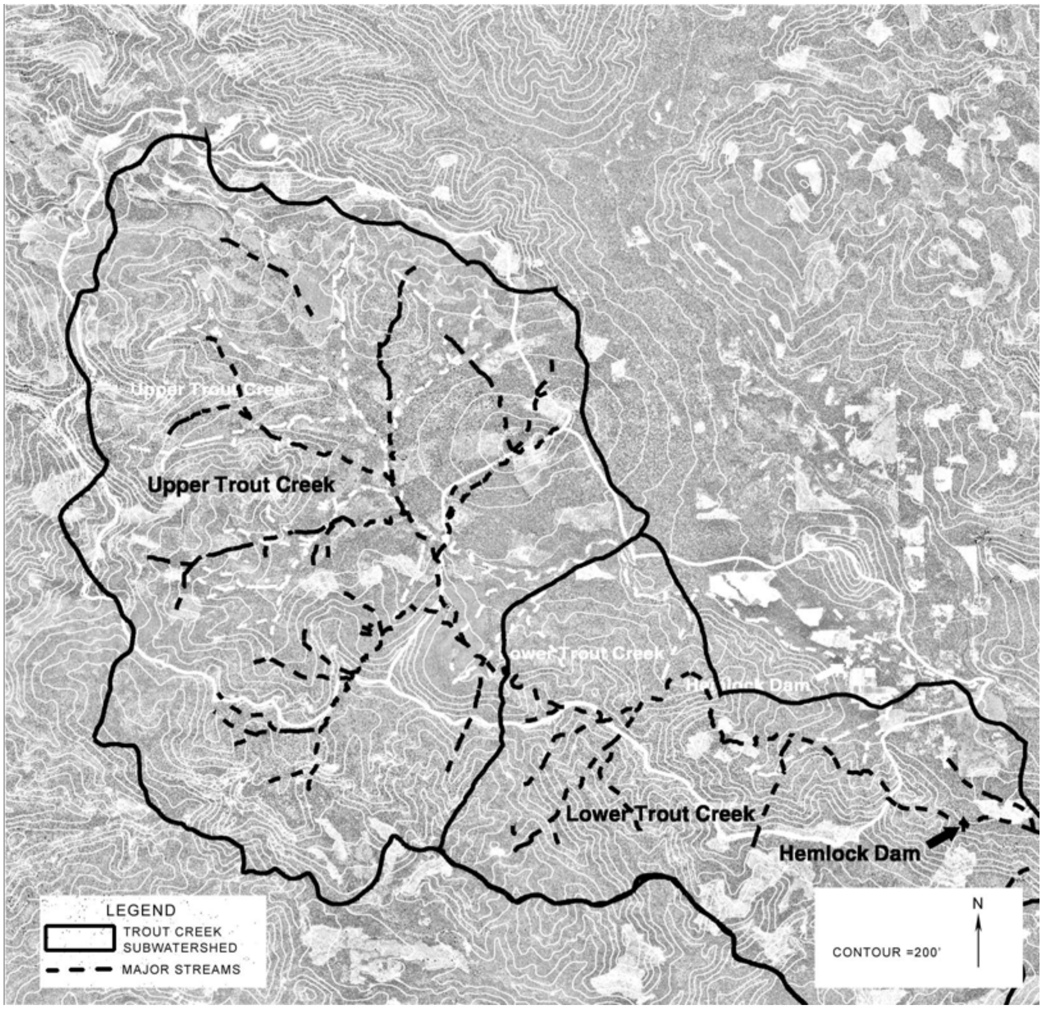

Figure 3-5. Trout Creek subwatershed, showing the location of Hemlock Dam and the Upper and Lower Trout Creek drainages.

Trout Creek originates in springs along the lava flow associated with West Crater. Gradients in Trout Creek drop sharply as the river approaches and crosses the Trout Creek flats . Most of the significant tributaries to Trout Creek (Crater, Compass, East Fork Trout, Layout Creeks) enter the Creek as it crosses the Trout Creek flats . Figure 3-6 shows a longitudinal profile of Trout Creek along with the relative location of major tributaries. Following extensive logging in riparian areas of Trout Creek flats and removal of woody debris from streams in the area during the mid- and late 1900's, these channels have widened, downcut, and shallowed, and currently form a network of very low gradient highly exposed channels.

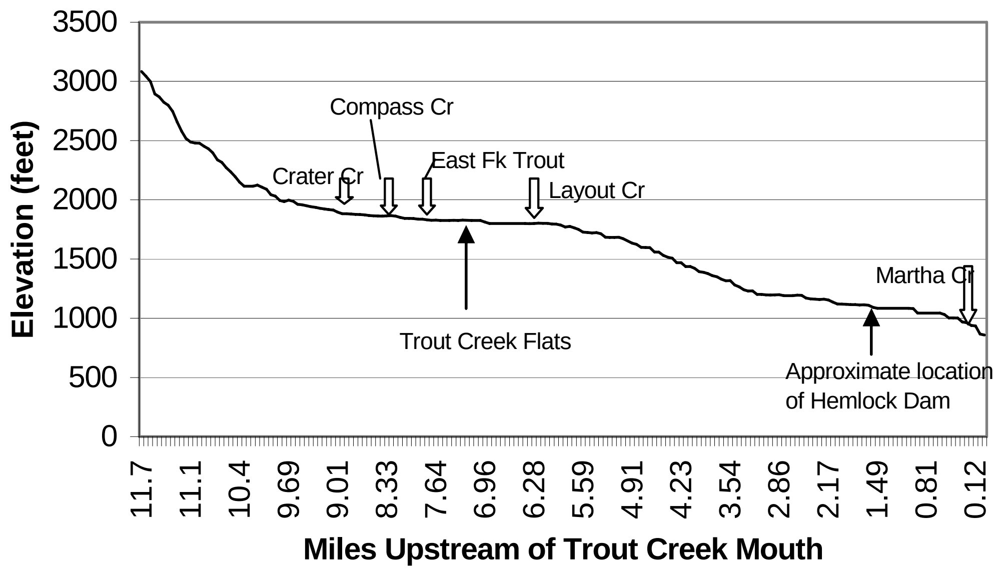

Figure 3-6. Longitudinal profile of Trout Creek.

The lower portion of the Trout Creek subwatershed is longer and narrower in shape, trending from northwest to southeast. This portion of the subwatershed is bounded on the south and west by a ridge extending from Mowich Butte to the southeast through Sedum Point. The northeastern border is formed by Trout Creek Hill, Bunker Hill, and the gentle slopes surrounding these two volcanoes. Small tributaries joining Trout Creek from the north drain relatively gentle slopes between Trout Creek and the mainstem of the Wind River. On the south side of Trout Creek topography is much steeper and drainages are more incised.

Once leaving the upper drainage and Trout Creek Flats, Trout Creek flows through a steep canyon and high gradient bedrock and boulder-controlled reaches (Rosgen A and B channels) before reaching Hemlock Lake. The only major tributary in the lower drainage is Martha Creek, which joins Trout Creek below Hemlock Dam and just upstream of the mouth of Trout Creek. Hemlock Dam is located approximately 1.8 river miles upstream of the mouth of Trout Creek. Channel gradients through the lower watershed are relatively high with the exception of the reach through Hemlock Lake. The lake has been substantially filled with sediment deposits through the years and it now presents an area of very slack, shallow water during the summer months.

3.1.2.3. Local Scale

Hemlock Lake has been in place for at least 70 years, since the construction of Hemlock Dam. Prior to the building of Hemlock Dam there was an impoundment at nearly the same location resulting (at least in part) from the presence of a splash dam, which was immediately upstream of Hemlock Dam. Figure 3-7 is a 1912 photograph showing the area now occupied by Hemlock Lake. At the time of the photo the splash dam was in place and the lower end of what is now Hemlock Lake was inundated. In the photo, downstream is to the left.

Figure 3-7. Hemlock Lake area in 1912. The splash dam can be seen near the center of the photo, at the lower end of the lake (downstream is to the left).

Lake Sediments

The lake has been filling with sediment since construction of Hemlock Dam. Concerns about the filling of the lake are found in anecdotal reports from as early as the 1950's (Misner letter to the USFS, 2004), and in Forest Service files from at least as early as 1970 (Thorn letter in June, 1970 to WW Gano in Appendix C of Seesholtz 1986). In 1986 the Forest Service conducted a study of the "sedimentation" of Hemlock Lake and proposed several alternatives for improving the recreational uses of the lake and its aesthetic values, primarily by dredging. Although the 1986 USFS report identifies a buildup of sediments in the reservoir, no documentation has been found as to the actual rate of accumulation or of any actual measurements of the sediment.

In the absence of any data describing the rate of filling of the reservoir, in 2004 the USFS and Bureau of Reclamation (USDI) took measurements and used data collected previously to assess the relative rates of sediment buildup in different parts of the reservoir.

Bathymetric surveys were conducted in 1994 for the purpose of evaluating reservoir storage and dredging options (Otak 1994). In spring of 2004 additional elevation surveys were conducted by USFS personnel to compare sediment levels in the lake at that time with those of 1994. Although the 1994 survey was not replicated point-by-point in the 2004 survey, the results provide a general characterization of elevation changes occurring over the past decade in the lreservoir and immediate vicinity. Figure 3-8 is an aerial view of the reservoir showing the average differences in surveyed elevations across the reservoir area.

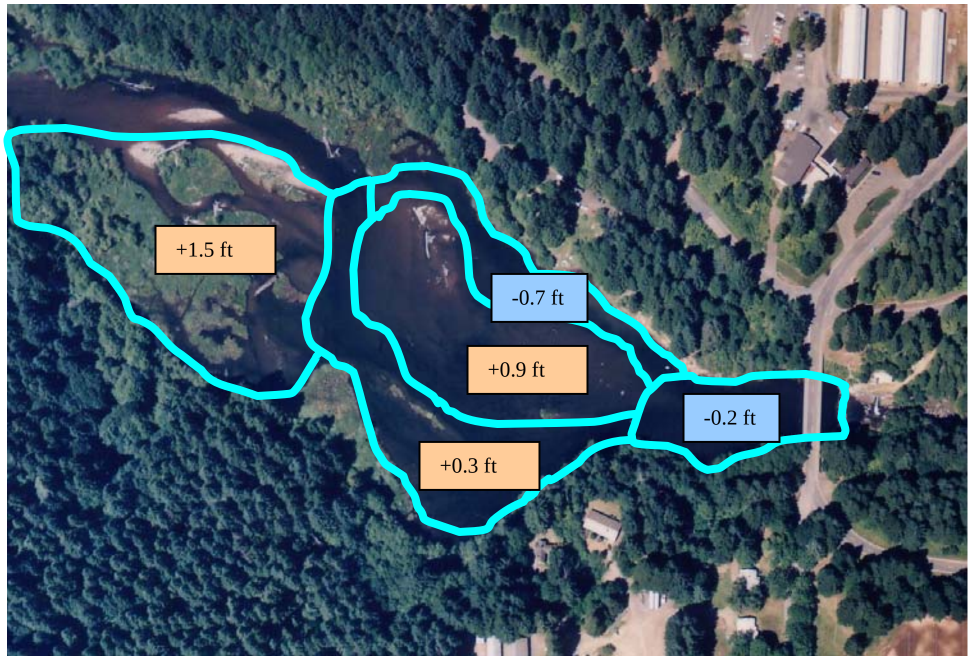

Figure 3-8. Aerial view of Hemlock Lake comparing average elevations measured in 1994 and 2004 surveys across different parts of the reservoir.

From this comparison, three of the five areas analyzed show an increase in elevation over the ten-year period of time. The average increase in elevation across the three areas was just under one foot. The other two areas show a decrease in elevation of the sediments of approximately 0.5 feet on average, indicating that sediment depths in these areas were actually reduced over the ten-year interval.

Work done by the BOR provides an additional perspective on the growth of the bars and delta area. They analyzed air photos of the reservoir for every decade since 1959 and found that the delta increased in aerial size by approximately 1.4 acres during that period (USDI 2004a). Figure 3-9 summarizes their findings.

Figure 3-9 Aerial Photograph of Hemlock Reservoir in 2000. The Blue Line is the Delta in 1959; the Red Line is the Delta in 2000.

Taken together, these analyses point to a continued accumulation of sediments in the reservoir over the past several decades, but also indicate that—at least for the past ten years—the degree of change within the reservoir has not been dramatic. Within the time period analyzed Trout Creek experienced a number of large floods, including one estimated to be the 100-year flood. Sediments in the reservoir would have been affected by other factors during this time as well. According to Seesholtz (1986), the Wind River Nursery used to regularly flush sediments through the sluice gate until approximately 1977 when the practice was curtailed. The volumes of material routed downstream in this way are unknown. In addition to the sluicing of sediments, long time residents of the area recall an effort in the late 1950’s in which sediments from the lower end of the reservoir were pushed up onto the island to help maintain depth in the reservoir (Misner, letter to the USFS, 2004). Although the 1950’s work did not remove sediment from the reservoir area, it did alter the location of the material and in that way may have contributed to other adjustments in channel location and in the rates and locations of subsequent sediment and debris deposition within the reservoir.

As a result of both natural variations in stream flows and intentional manipulation of the dam or sediments it is likely that the reservoir has gone through periods of greater or lesser rates of filling and of scouring and routing sediment over the dam. Through this process, different parts of the reservoir are likely to have experienced accumulation or loss of sediment based on the alignment of the main channel as it transits the reservoir.

Sediment Characteristics—Hemlock Lake

In 2001 the USFS commissioned a study of the sediments within the reservoir to assess both the volume of material and quality of the sediments. This study manually probed the depths of sediment throughout the reservoir and submitted nine composited samples from across the reservoir and at depths within the reservoir for conventional and chemical analysis. The study followed a Sampling and Analysis Plan that was prepared in general accordance with U.S. Army Corps of Engineers and U.S. Environmental Protection Agency regulatory guidance for sediment removal and disposal (NW Geotech 2002). The study found an estimated volume of approximately 61,800 cubic yards of sediment within the reservoir (ibid). Substrates within the reservoir were found to be primarily coarse-grained materials consisting of sand and gravel-sized particles, with the percentage of silts and clays ranging from about 3 to 9 percent (id). Table 3-3 summarizes the results of the particle size analysis. The chemical analysis covered some 15 parameters or groups of compounds. Results indicated low levels of a few contaminants in one area of the reservoir. The contaminants are presumably residues from various materials used by the Wind River Nursery and District over the past years. Results of the completed sediment study were submitted to the Washington State Department of Ecology (WDOE) for additional interpretation relative to sediment quality standards or guidelines, and disposal options for the sediments. The WDOE concluded that based on the limited number of contaminants detected in the sediments, the low concentrations, and the limited area in which any contaminants were found, the sediments did not warrant special consideration for in-water disposal or for upland uses (McMillan 2002).

Table 3-3. Representative diameters measured from sediment samples in Hemlock reservoir.

Sample Number	d10 (mm)	d50 (mm)	d90 (mm)
A-1	0.07	0.30	1.5
A-2	0.08	0.45	3.5
A-3	0.19	0.85	4.0
A-4	0.09	0.40	2.8
A-5	0.15	0.92	4.2
A-6	0.09	0.75	3.5
A-7	0.20	0.80	4.0
A-8	0.08	0.50	3.0
Average	**0.12**	**0.62**	**3.31**

The BOR used the results of the NW Geotech study along with stream elevations upstream and downstream of the dam to project a total sediment volume within the reservoir and delta (USDI 2004a). Estimated sediment deposition within the reservoir and delta ranged from 48,000 cubic yards to 93,000 cubic yards (Table 3-4).

Table 3-4. Summary of estimated sediment volumes and composition. (Source: BOR, 2004 and NW Geotech, 2002.)

	Lower Estimate (yd^3)	Upper Estimate (yd^3)	Composition
Reservoir Pool	41,000	82,000	Sand, d_{50} = 0.6 mm
Delta	6,700	11,000	Sand and gravel
Total	48,000	93,000	

Sediment Characteristics—Trout Creek

Upstream of Hemlock Lake the bed material is largely gravel and cobble with a median particle diameter of 60 mm (USDI 2004a). Downstream of Hemlock Dam, Trout Creek enters a canyon and the bed is composed of large boulders and bedrock. Gravel is only found on the margins of the channel in this reach which has been starved of sediment replenishment for years as a result of sediment deposition that occurs behind Hemlock Dam.

Sediment Transport

The longitudinal profiles of both Trout Creek and the Wind River are shown in Figure 3-10, along with the QS product or each stream. The QS product is an indicator of the power available for sediment transport (USDI 2004a). Reaches with a low QS product cannot transport as much sediment as reaches with higher QS products (*ibid.*).

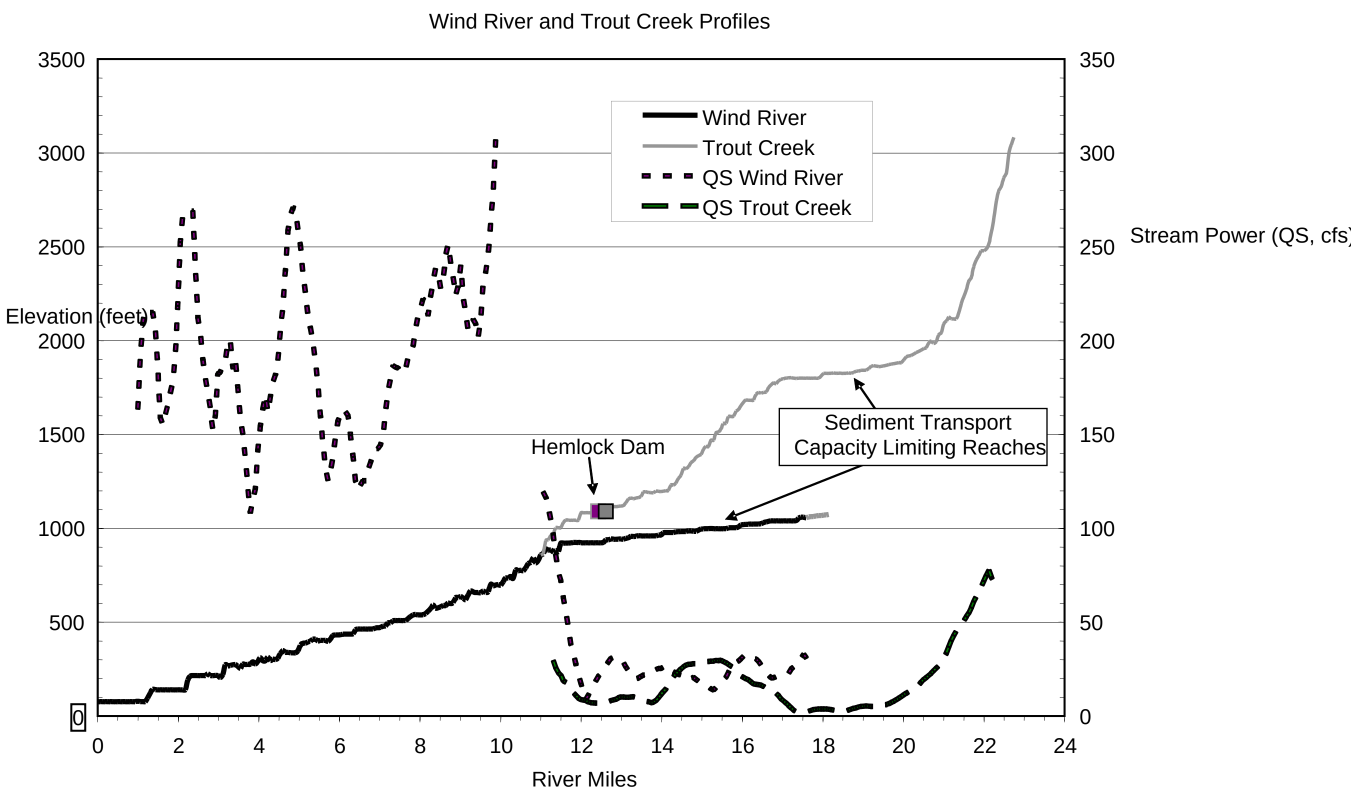

Figure 3-10. Stream profile and stream power in Wind River and Trout Creek (USDI 2004a).

On Trout Creek, stream power increases sharply just below the dam due to the increased channel slopes. Similarly, stream power in the Wind River increases significantly in the reach bracketing the Trout Creek confluence. The calculated QS products along with the lack of stored sediment and dominance of bedrock in the downstream reaches of Trout Creek (Figure 3-11) and in the Wind River (Figure 3-12) indicate that these reaches are sediment supply-limited, meaning that they are capable of moving more sediment than is currently being delivered to them. The significance of this is that these reaches of Trout Creek and the Wind River are capable of rapidly routing gravel-sized or smaller sediments that are delivered to them.

Figure 3-11. Boulder-dominated reach of Trout Creek, approximately 0.5 miles downstream of Hemlock Dam.

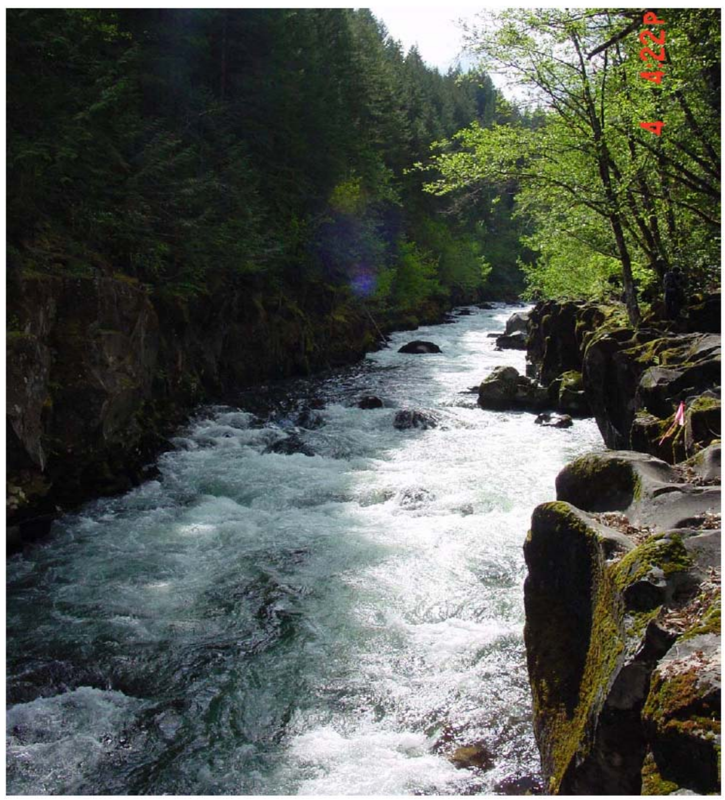

Figure 3-12 Bedrock-controlled reach on the Wind River, approximately ¼ mile downstream of the confluence with Trout Creek.

3.1.3. Water Temperature

The USFS has measured water temperatures in the Wind River and its major tributaries since the 1970's. Since the early 1990's the Yakama Indian Nation, U.S. Geological Survey, and Underwood Conservation District have also been involved in water temperature monitoring in the watershed. Based on monitoring data collected during the 1990's, Trout Creek, Bear Creek, and Eightmile Creek were included on the Washington Department of Ecology (WDOE) 303(d) list of water bodies that do not meet state water quality standards. These streams were listed for exceeding the standard for maximum water temperature. As a result of this listing the USFS and WDOE worked together to develop plans for improving water temperature conditions throughout the watershed. These plans included a *Water Quality Restoration Plan* (WQRP) developed primarily by the USFS and a *Total Maximum Daily Load* (TMDL) developed primarily by WDOE. The completion of these documents lead to the Wind River and its tributaries being classified as *Category 4a* on the 303(d) list. This category includes "polluted water bodies" that are under an approved TMDL. The USFS is currently implementing recommendations from the TMDL and WQRP to improve water temperatures within the watershed, but at this time a number of streams in the watershed—including particularly Trout Creek—continue to exceed the state temperature standards.

3.1.3.1. Watershed-Scale Conditions

Water temperatures in the Wind River show a general warming in a downstream direction. From headwaters to mouth the Wind River measures over 30 miles in length. During a two-year monitoring period (1999 – 2000), the total increase in maximum water temperature from the uppermost monitoring station (Wind River above Pete's Gulch) to the lowermost monitoring station (Wind River near the mouth of the Wind River) averaged just 1.7°C. Figure 3-13 illustrates how water temperatures change along the course of the Wind River. The figure reflects data from the summer of 2000. Headwaters of the Wind River are to the left of the chart, and the data are arrayed in a downstream direction going to the right.

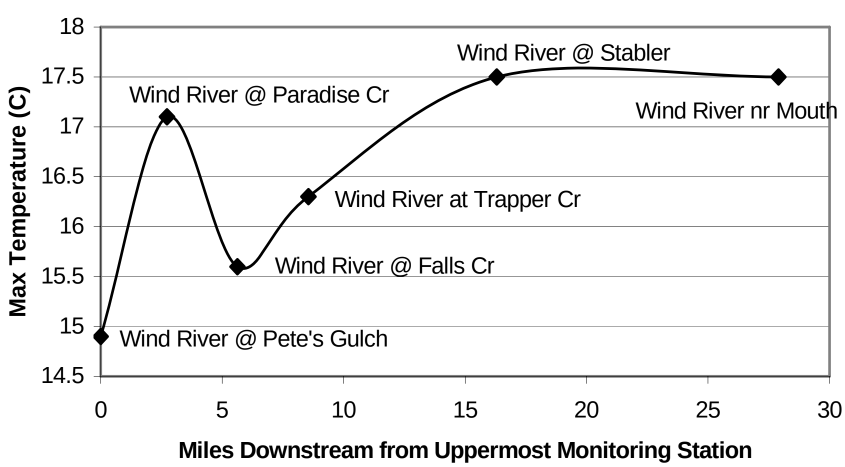

Figure 3-13. Maximum water temperatures at monitoring stations along the Wind River, July 31, 2000. Data are arranged in a downstream direction from left to right.

Water temperatures within the Wind River are affected by a combination of conditions on the mainstem, along with inputs of water contributed by various tributaries and other seeps or springs along the channel. Headwaters of the Wind River originate in McClellan Meadows and from a large number of springs and seeps in the gently sloping ground that forms a saddle between the Wind River watershed and the Lewis River watershed to the north. The large open expanse of McClellan Meadows allows water temperatures even high up in the watershed to be somewhat elevated (Figure 3-13). As the Wind River flows downslope it is joined by a combination of both warmer and cooler inputs from its tributaries.

3.1.3.2. Subwatershed-Scale Conditions

Over the past decade of monitoring, Trout Creek has consistently had the highest water temperatures of any major tributary to the Wind River. Water temperature standards have been exceeded in every year of monitoring, commonly exceeding 20°C, and at times exceeding the standard for over two months of the year (Table 3-5).

Table 3-5. Annual water temperature peaks in Trout Creek, and the number of days water temperature standards were exceeded per year, 1993 – 2003. (Data is from the monitoring station just upstream of Hemlock Lake.)

Year	Maximum Recorded Water Temperature	Number of Days Water Temperatures Exceed the Washington State Standard
1993	20.8	33
1994	No data	No data
1995	22.6	69
1996	20.2	49
1997	20.8 (truncated file)	19+(truncated file)
1998	23.2	75
1999	19.1	27
2000	20.8	42
2001	No data	No data
2002	21.0	56
2003	20.6	79
Average	21.0	54

Causes of high water temperatures in Trout Creek include: 1) wide, shallow, and poorly shaded channels in the upper watershed (a result of channel widening caused in part by past logging of riparian areas and removal of large woody debris from stream channels); 2) large areas of shallow, slow moving or still water in the Trout Creek flats area created by natural ponds, wetlands and beaver impoundments; 3) warm water inputs from tributaries which were logged and/or burned and cleared of woody debris; 4) heating in the mainstem of Trout Creek below the Flats; and 5) heating occurring in Hemlock Lake (heating that occurs in Hemlock Lake would not affect the temperatures described in Table 3-5 because data in that table was collected upstream of the reservoir).

While some of the heating in Trout Creek occurs within the mainstem, tributaries play a significant role as well. Figures 3-14 and 3-15 illustrate the water temperature trends in Trout Creek and throughout the subwatershed during the summer of 2003.

Figure 3-14 depicts the maximum water temperatures throughout the Trout Creek subwatershed during the summer of 2003, illustrating the areas of heating within both Trout Creek and its tributaries.

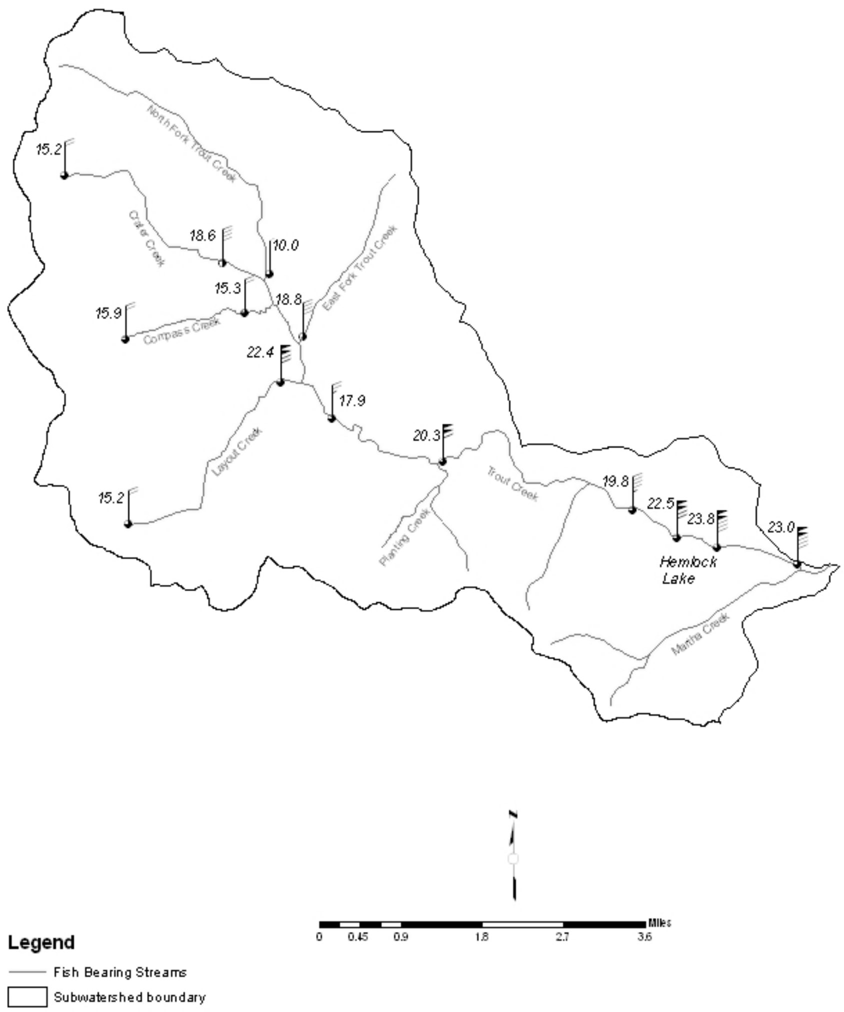

Figure 3-14. Peak summer water temperatures throughout the Trout Creek subwatershed, 2003.

Figure 3-15 shows the spatial water temperature trends along the mainstem of Trout Creek for the same year. Each point on the chart represents the peak water temperature at a different location on Trout Creek. The chart is organized so that upstream is to the left, and downstream is to the right.

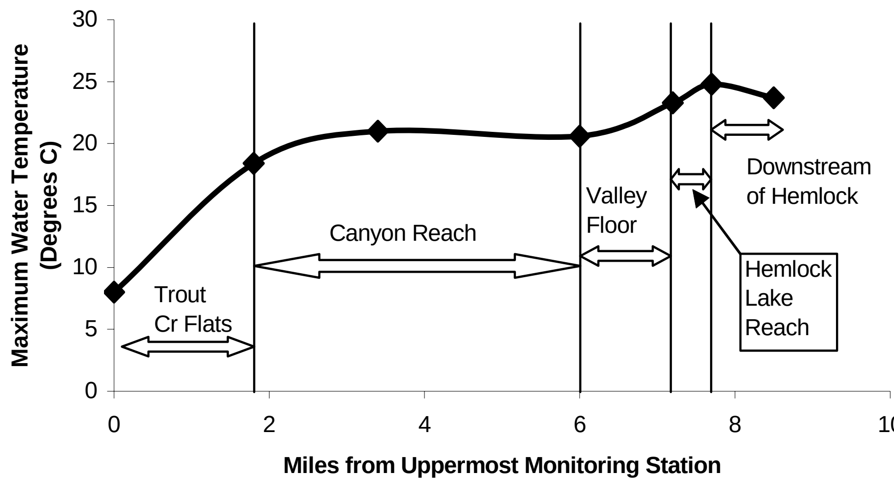

Figure 3-15. Peak water temperatures at seven locations on Trout Creek July 31, 2003. Upstream is to the left, downstream is to the right.

Temperature increases dramatically in the upper watershed where Trout Creek flows across the Trout Creek flats. Through this reach the rate of heating in Trout Creek approaches 6°C per river mile, resulting from a combination of persistent effects of past logging activities and inherent geomorphic conditions of the upper watershed. As Trout Creek approaches and passes through the upper canyon, temperature increases decline and then the stream actually begins to cool slightly. As Trout Creek exits the canyon and enters the valley floor, water temperatures again begin to climb, peaking in the reach that includes Hemlock Lake. Rates of temperature increase in the reaches below the canyon begin at 2.25°C per river mile, and reach 3.0°C per river mile in the Hemlock Lake reach. Downstream of Hemlock Dam maximum water temperatures begin to decline as Trout Creek flows through the lower canyon toward the Wind River.

3.1.3.3. Local Scale

Existing Condition

On the warmest day during the summer of 2003 the increase in peak water temperature through the Hemlock Lake reach was 1.5°C. The rate of increase through the reservoir reach was approximately 3.0°C per mile of stream; somewhat higher than the adjoining upstream reach, but lower than the maximum rate of heating in the Trout Creek Flats. The rate of heating through the reservoir is probably limited to some extent by the greater volumes of water and the fact that incoming water is already extremely warm and as a result may have higher levels of evaporative cooling influences.

In addition to the increase in maximum water temperatures seen through Hemlock Lake, there is also an increase in the minimum daily water temperature during summer months, resulting in higher average temperatures and a reduced range of diurnal temperature fluctuation. This effect occurs both in the reservoir and in the reach of Trout Creek downstream of the dam. Timing of the daily peak in water temperature is also shifted to later in the day at the station just below the dam, due in part to the way water moves through the reservoir. The combination of these factors leads to a condition in which the water temperature upstream of the reservoir is, at times, 4°C cooler than downstream of the reservoir. The time of greatest difference in temperature would be late evening through early morning. Figure 3-16 illustrates these effects by comparing hourly water temperatures at the upstream and downstream sites for a one-week period during the summer of 2003.

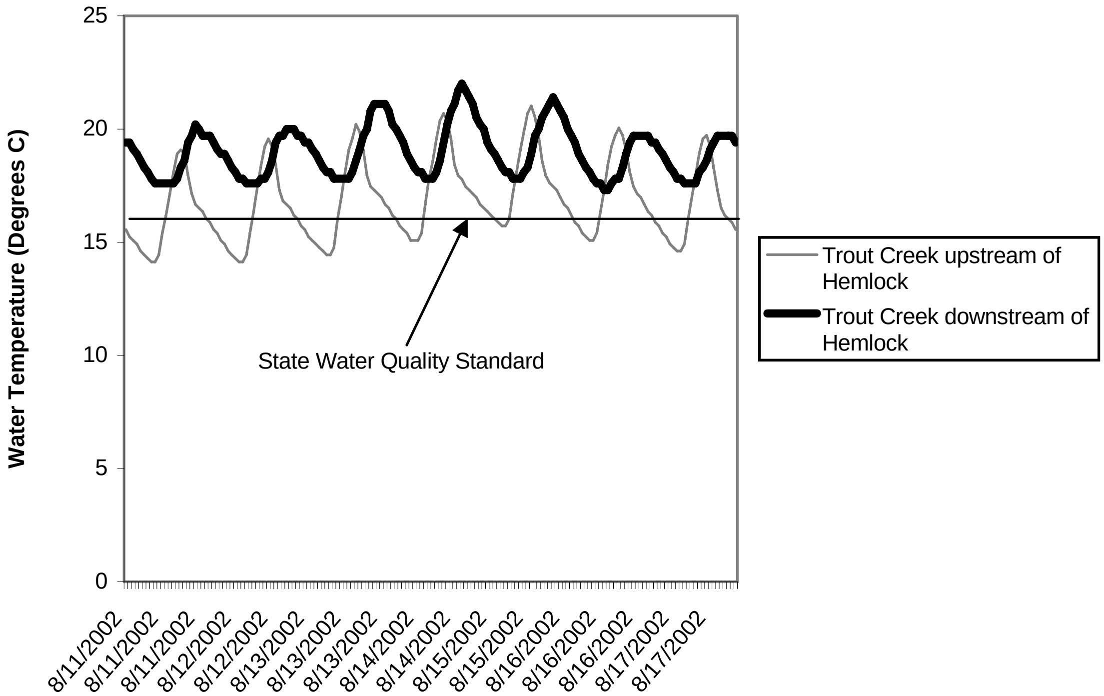

Figure 3-16. Hourly water temperatures in Trout Creek upstream and downstream of Hemlock Lake for the week of August 11 – 17, 2003.

Daily water temperatures during the week shown average 16.8°C and go through a daily range of approximately 5.0°C at the upstream station. Just downstream of Hemlock Dam the average daily temperature is 19.0°C and the range of temperatures is around 3.5°C. As a result of the higher peak and average temperatures in the reservoir, the frequency and duration at which water in the reservoir exceeds state water quality standards is also increased. The greater duration of high water temperatures can affect the health of fish and other aquatic organisms living in the water. Figure 3-17 compares temperatures from upstream and downstream of the reservoir in terms of the number of days that temperatures have exceeded both the state standard of 16°C and two threshold levels of temperature that have significance to salmonids (20°C and 24°C).

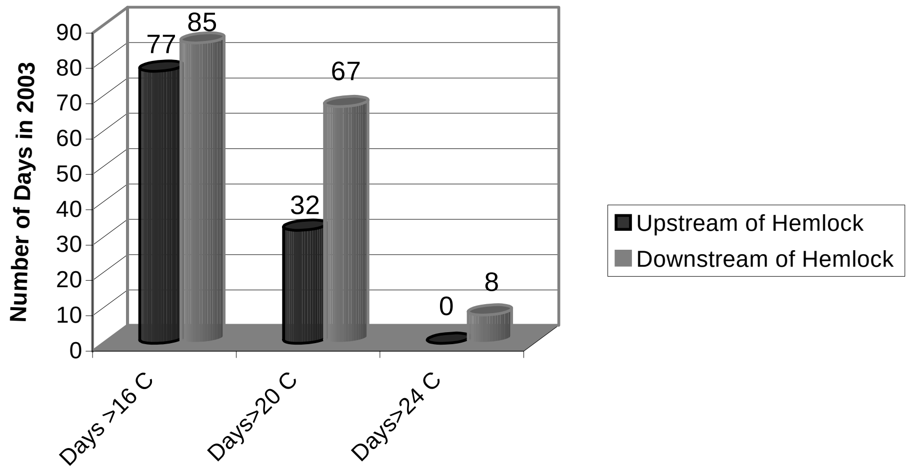

Figure 3-17. Number of days in the summer of 2003 in which water temperatures exceeded threshold levels on Trout Creek upstream and downstream of Hemlock Dam.

Figure 3-17 shows that during the summer of 2003, the dam and reservoir had little effect on the number of days that water temperature standards were exceeded. This is because throughout much of the summer water temperatures upstream in Trout Creek were already high. A more significant effect is evident for the extreme high temperatures. The number of days temperatures exceeded 20°C was over doubled through the reservoir in this year and while upstream reaches never reached 24°C that condition was reached on eight days downstream of the reservoir.

During the summer of 2003 temperatures in Trout Creek peaked on July 22, at 24.8°C. On that day, water temperatures at the monitoring station just downstream of Hemlock Dam exceeded 24°C for approximately eight hours and exceeded 20°C for the entire 24-hour period. For the two-week period surrounding this date (July 19 – August 3) water temperatures never dropped below 20°C at the downstream station, while upstream water temperatures dipped below 20°C every night.

Within Hemlock Lake there is a high degree of variability in water temperature resulting from differences in flow paths and mixing through the reservoir, differences in depth and exposure to the sun, and potentially from inputs of water from surface and subsurface sources around the reservoir. Because of the variability of conditions within the reservoir, measurements of ambient conditions in the stream flowing out of the reservoir are inadequate to characterize water temperature conditions across the entire reservoir. To begin characterizing the range of conditions in the reservoir, grab samples of water temperature were collected from various locations in the reservoir and at a range of depths during the summers of 2003 and 2004. These efforts have shown that there are three significantly cooler pockets of water within the reservoir where deep pools exist. Two of the three are located immediately upstream of the dam. The third and deepest pool is on the south side of the reservoir. This pool is approximately 12 feet deep and can have temperatures as much as 8 – 9 ºC cooler at the bottom of the pool compared to the surface water. This pool is very limited in area and when used by recreationists has much less temperature variation over its depth. It appears that the turbulence caused by swimmers and divers around this pool cause mixing of the water and eliminates the thermal stratification that otherwise occurs there.

3.1.4. Turbidity/Suspended Sediment

Measurement of turbidity or suspended sediment levels in the Wind River watershed has been sporadic over time, but limited data exists from USFS, Underwood Conservation District, and WDOE monitoring.

3.1.4.1. Watershed-Scale Conditions

Michaud (2002) summarizes the studies done by each of these agencies over the past few decades. The data show that turbidity levels are generally low in comparison with more developed systems, but vary across the watershed and over time (Tables 3-6 and 3-7).

Table 3-6. Summary of WDOE's Turbidity Monitoring Data for the Wind River (October 1994 – September 1995), as reported by Michaud (2002).

	Summer[(1)]		Winter[(2)]	
Parameter	**Range**	**Mean**	**Range**	**Mean**
Turbidity (NTU)	0.7 – 3.0	1.3	0.5 - 19	4.8

[(1)]Summer range calculated using July and August data for 1995 (N = 6).
[(2)]Winter range calculated using November through March data for water year 1994-95 (N = 18).

Table 3-7. Turbidities measured on the Wind River, 1999 – 2001 (as reported in Michaud 2002).

Station	Range of Measured Turbidity (NTU's)	Mean	Number of Samples
Mouth of Wind River	0.4 – 12	4.2	6
Wind River at Stabler	0.4 – 7.1	2.5	6
Wind River below Falls Cr	0.3 – 2.2	1.3	6

In general, the monitoring results show that turbidities are lower in the summer months, and typically—although not always—increase during the winter in response to increased streamflow levels. Also, turbidity levels tend to increase in a downstream direction. Monitoring results from USFS measurements taken at three locations on the Wind River during the winters of 1995 – 1998 exemplify these general patterns (Figure 3-18).

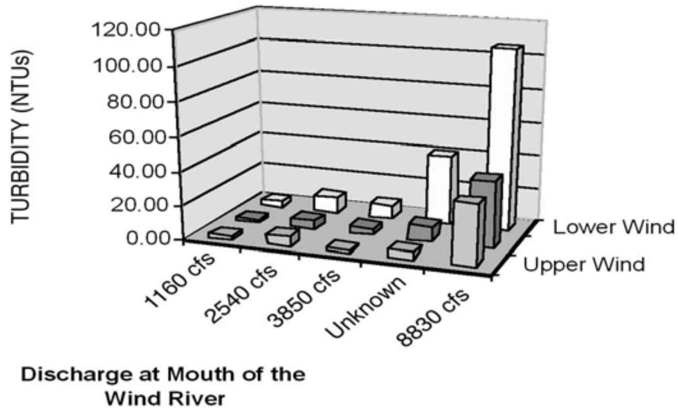

Figure 3-18. Turbidity at three stations on the Wind River at a range of streamflow levels in 1995 – 1998.

The figure shows that during these sampling periods turbidity levels were always higher in the lower Wind River than at either of the upstream stations. It is noteworthy that the difference in turbidity between the lower Wind River station and the others is accentuated during higher streamflows. This figure represents only a handful of grab samples, thus they may not typify conditions in the Wind River. However, the downstream increase in turbidity levels does appear to be a strong pattern. In addition to the downstream increase the figure shows how, in most cases, the turbidity increases as the stream discharge level increases. This reflects a combination of the increased power of the stream during higher flows and also the increased levels of sediment introduction that occur during periods of runoff.

3.1.4.2. Subwatershed-Scale Conditions

During the same five sampling events depicted in Figure 3-20 above, Trout Creek generally had some of the higher turbidity levels of any of the ten stations monitored within the Wind River watershed. Table 3-8 compares the average of five turbidity measurements in Trout Creek during these events with the turbidity measured at the three locations on the Wind River.

Table 3-8. Comparison of turbidity levels on Trout Creek with three stations on the Wind River during 5 sampling events in the winters of 1995 – 1998 (USDA 1995 – 1998).

Monitoring Station	Average Turbidity	Range
Trout Creek	15.8	2.2 – 46.7
Upper Wind River	10.1	2.0 – 35.4
Middle Wind River	11.7	1.9 – 39.0
Lower Wind River	29.1	3.6 – 107.2

The largest and most consistent inputs of sediment within the Trout Creek subwatershed appear to be from channel erosion in the Trout Creek flats and road systems throughout the subwatershed. Although the largest inputs of sediment appear to occur in the upper reaches of Trout Creek, turbidity levels have generally been highest near the mouth of Trout Creek as seen in Underwood Conservation District (UCD) monitoring results (Table 3-9).

Table 3-9. Turbidity at two stations on Trout Creek and on six days of monitoring, 1999 – 2001 (UCD 1999 – 2001).

Date	Upper Trout Creek (43 Bridge)	Trout at Creek Mouth
6/21/99	0.58	0.56
10/5/99	0.47	0.4
12/7/99	1.06	1.81
12/15/99	4.0	7.39
4/17/00	1.04	1.51
10/23/01	3.12	3.85

3.1.5. Wetlands

The National Wetland Inventory identifies approximately 722 acres of wetlands in the Wind River watershed. The wetlands are classified based on their dominant characteristics. Wetland types in the watershed include forested/shrub dominated wetlands, riverine wetlands, freshwater emergent wetlands, ponds and lakes. Over half of the wetlands in the watershed are forested or shrub-dominated. The largest wetlands in the watershed include McClellan Meadows and Black Creek Swamp on the National Forest, and the wetland complexes along the middle Wind River and near the mouth of the river (Figure 3-19).

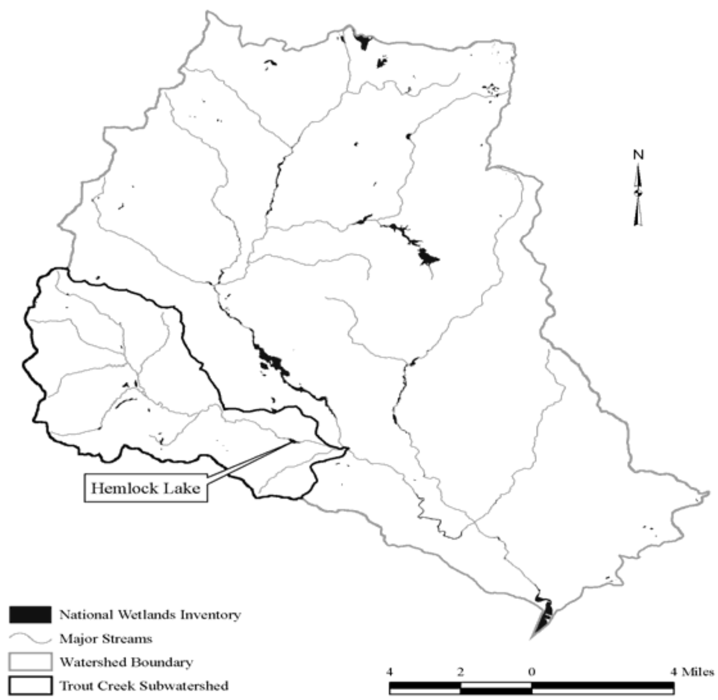

Figure 3-19. Wetlands in the Wind River watershed based on the National Wetlands survey.

Within the Trout Creek subwatershed, there are approximately 88 acres of wetlands, with over half of this area comprised of forested or shrub-dominted wetlands. Most of the wetlands in the

Trout Creek drainage occur in the upper reaches in the area known as Trout Creek flats . However, there are a number of small wetlands associated with Hemlock Lake. These wetlands total approximately 5.4 acres, and are discussed in more detail in Chapter 4.

3.2. Aquatics – Fish and Fish Habitat

3.2.1. Background, History and Key Areas of Concern

Since the late 1800’s the predominant land management activity within the Wind River watershed has been timber harvest. Historically, “splash dams” were constructed on the main stem Wind River and tributaries to stockpile and transport logs down stream to the mills along the Columbia River. Splash dams and the associated log drives which sluiced logs down Trout Creek and the Wind River had devastating impacts on anadromous fish and aquatic habitat including:

- partial or complete lack of fish passage,
- complete removal of instream large woody debris below the structure by dynamiting the channel to facilitate log transport,
- scour of the stream channel to bedrock as a result of the unnaturally high and frequent freshets created by splash-damming,
- scour of fish spawning redds,
- direct injury to adult and juvenile salmonids from log transport,
- stranding of adult and juvenile fish below the structure because of unnaturally high and frequent artificial freshets (Wendler and DesChamps, 1955, Sedell and Luchessa, 1982).

Early managers attempted to reduce impacts to fish by building wooden fish ladders around the splash dam at Trout Creek to maintain steelhead immigration to the spawning habitat in Trout Creek flats six river miles up-stream. A concrete fish ladder was constructed in 1936 following the replacement of the wooden splash dam with a concrete structure (Figure3-20 and Figure 3-21). The ladder is one of the first concrete fish ladders built in the Pacific Northwest pre-dating the ladder on Bonneville Dam (Mack, 1995). Refer also to section **3.4.2 Historic Period Use**, p. III-43, *ff*.

Figure 3-20. 1935 photograph of Hemlock Dam under construction, Skamania County, Washington.

Figure 3-21. 2001 photograph of Hemlock Dam looking downstream from the reservoir, note the fish ladder on the right side of the photograph. Skamania County, Washington.

The upper Trout Creek watershed, or "Trout Creek flats " (river mile 6.5 – 9.0), was tractor logged in the late 1940's. Revegetation efforts following logging failed apparently due to compacted soils. In the late 1960's the majority flats area was "ripped" with heavy equipment to de-compact the soils and restore percolation (J.Forsberg, pers. com. 2000). In the 1970's log jams were thought to be migration barriers to steelhead. Log jams and other wood was removed or "cleaned" from stream channels. The removal of large woody debris (LWD) eliminated the natural water velocity modification and sediment storage that the stream needed to function properly. The removal of wood from within the channel instigated serious channel degradation. The channel degradation or "down-cutting" instigated severe bank erosion within Trout Creek flats . The bank erosion within the upper watershed directly delivers coarse and fine sediment into the stream which is consequently transported and deposited behind Hemlock Dam. Consequently maximum water temperatures have exceeded 24°C (75°F) in the upper watershed and have reached temperatures >27°C (80°F) in the reservoir of Hemlock Dam.

In the late 1970's to mid 1980's the population of steelhead within Trout Creek declined dramatically (WDFW Redd Surveys and Adult Trap Data 1980 – 2004). Steelhead declines over the past century within the Trout Creek watershed have been attributed to ocean conditions, historic splash damming, the construction of Hemlock Dam, riparian timber harvest and in-stream large woody debris removal (USDA 2001). Rehabilitation efforts focused on restoring riparian areas, bank stability, stream shade, large wood and flood plain connectivity began in earnest in 1992.

3.2.2. Wind River

The Wind River enters the Bonneville pool of the Columbia River at river mile (RM) 154. Bonneville dam inundated the alluvial fan at the mouth of the Wind River flooding 1.1 river miles in 1938. After the completion of Bonneville Dam in 1938, the alluvial fan at the mouth of the Wind River and the lower 2 – 3 miles of the Wind River were inundated and backwatered. This lower reach of the river is believed to have been an extremely productive area for fall chinook, coho salmon, coastal cutthroat trout, winter steelhead and potentially bull trout, chum and pink salmon. Since the inundation of the mouth and alluvial fan, chinook and coho have limited spawning gravel below Shipherd Falls. The mouth has begun to rebuild its alluvial fan, however development and dredging near the mouth has impeded the process.

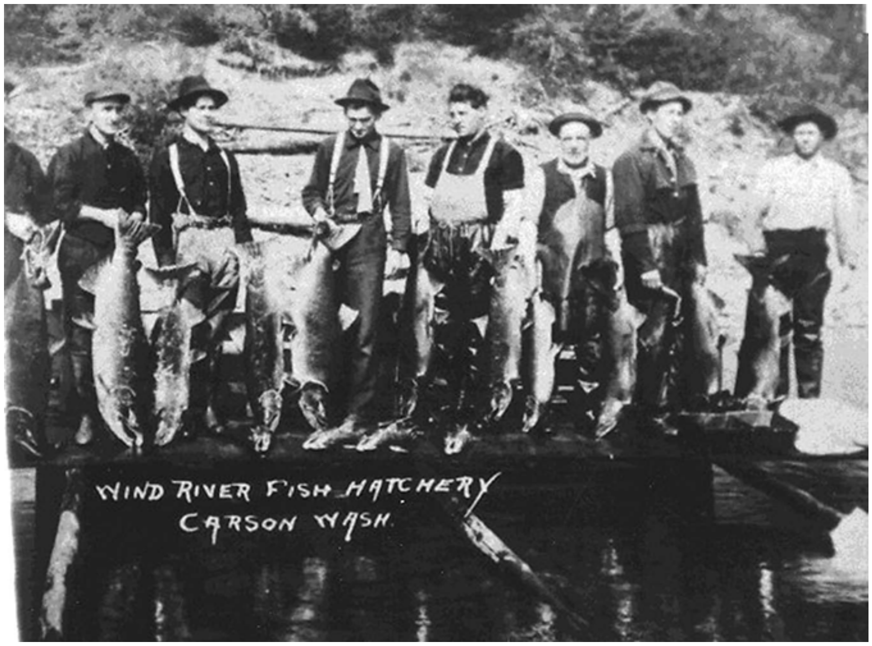

Figure 3-22. Circa 1912 photo of chinook taken at the mouth of the Wind River for the Wind River Fish Hatchery, Skamania County, Washington.

Figure 3-23. Aerial photograph of the mouth of the Wind River in 1930, before the construction of Bonneville Dam, Skamania County, Washington.

Figure 3-24. Aerial photograph of the mouth of the Wind River depicting the extent of backwater inundation of Bonneville Dam and loss of alluvial fan habitat, Skamania County, Washington.

There are a series of stair-step waterfalls at RM 2 (collectively known as Shipherd Falls) that total 45 feet in height. Historically, summer steelhead were the only anadromous fish species that could negotiate the falls. Winter steelhead, spring chinook, fall chinook, coho and chum salmon were relegated to the mouth and lower three river miles. In 1951 a fish ladder was installed to allow passage of salmon. Today, wild summer and winter run steelhead and hatchery spring chinook occur above the falls/fish ladder and occupy approximately 120 river miles of mainstem and tributary habitat. Stray hatchery chinook rarely migrate into Trout Creek and the reaches above Hemlock Dam are occupied by wild summer steelhead, rainbow trout, brook trout and sculpin (USDA 1996).

3.2.2.1. Steelhead

(Onchorychus mykiss) Status in accordance with the Endangered Species Act (ESA): Threatened, Lower Columbia Ecologically Significant Unit (ESU), 3/98, critical habitat.

Steelhead are rainbow trout that migrate to the ocean. There are two recognized major genetic groups of steelhead, the inland group and the coastal group, which are separated by the Cascade Mountains (Huzyk and Tsuyuki 1974, Allendorf 1975, Okazaki 1984, Parkinson 1984, Schreck, *et al.* 1986, Reisenbichler, *et al.* 1992). Both resident and anadromous, inland and coastal steelhead occur in British Columbia, Washington, and Oregon. Among anadromous populations, two major life-history types are found: (1) summer-run (summer steelhead), and (2) winter-run (winter steelhead). While both summer- and winter-run steelhead spawn in the late winter/early spring, these subpopulations are differentiated primarily by run timing, duration of spawning migration, and sexual maturity at the time of freshwater entry. Summer steelhead enter fresh water between May and October with immature gonads. After spending several months migrating and holding in fresh water, these fish mature and spawn in the spring. In contrast, winter steelhead enter fresh water between November and April, with well-developed gonads, and spawn shortly thereafter (Schreck *et al.* 1986). The demarcation between coastal and inland resident and anadromous forms in the Columbia River Basin occurs at the Hood River in Oregon and the Wind River in Washington. Steelhead upstream of these boundaries are considered inland steelhead [(Phelps, *et al.* 1994, Busby, *et al.* 1996).

Historic steelhead habitat is extremely variable as these fish are adept at migrating through steep-gradient stream segments and over waterfalls of moderate height. Steelhead fry and parr can be found in very steep mountain stream habitat and in interior and coastal unconstrained valley streams.

Generally, steelhead remain in freshwater for one to three years and then emigrate to the ocean where they spend the next one to three years before returning to their natal stream. Steelhead are oviparous and can return to spawn more than once. Ocean migration is highly variable for steelhead trout, generally following the north and south migration strategies of coho salmon and chinook salmon. Steelhead are less gregarious than salmon in their ocean phase and individuals can range as far as offshore of the Aleutian Island area.

3.2.2.2. Lower Columbia River Steelhead

In 1998 the National Marine Fisheries Service (NMFS) listed steelhead (*Onchorhynchus mykiss*) as a Threatened species under the Endangered Species Act within the Lower Columbia River ESU (Evolutionary Significant Unit, a "distinct" population of Pacific salmon).

The Lower Columbia River ESU encompasses all steelhead runs in tributaries between the Cowlitz and Wind Rivers on the Washington side of the Columbia River, and the Willamette and Hood Rivers on the Oregon side. The populations of steelhead that make up the Lower Columbia River ESU are distinguished from adjacent populations by genetic and habitat characteristics. The ESU consists of summer and winter coastal steelhead runs in the tributaries of the Columbia River as it cuts through the Cascades. These populations are genetically distinct from inland populations (east of the Cascades), as well as from steelhead populations in the upper Willamette River Basin and coastal runs north and south of the Columbia River mouth. The major runs in the ESU, for which there are estimates of run size, are the Cowlitz River winter runs, Toutle River winter runs, Kalama River winter and summer runs, Lewis River winter and summer runs, Washougal River winter and summer runs, Wind River summer runs, Clackamas River winter and summer runs, Sandy River winter and summer runs, and Hood River winter and summer runs.

Many populations of steelhead in the Lower Columbia River ESU are dominated by hatchery escapement. Roughly 500,000 hatchery-raised steelhead are released into drainages within this ESU each year. As a result, first-generation hatchery fish are thought to make up 50 to 80% of the fish counted on natural spawning grounds on several runs, whereas others are almost free of hatchery influence including the summer run in the mainstem Washougal River (0%) and the winter runs in the North Fork Toutle and Wind Rivers (0 – 1%).

3.2.2.3. Steelhead found in the Wind River

Anadromous fish losses within the Wind River watershed have been attributed to adverse ocean conditions, construction of Bonneville Dam, timber harvest, road building and rural development (WDFW, *et al.* 1990). These activities in the upper watershed have severely impacted riparian areas and stream channels in several key steelhead sub-basins. This is evidenced by maximum water temperatures exceeding 24°C (75°F), risk of increased peak flows and increased sedimentation (USDA 1996). There is also concern about the ecological and genetic risks posed by the anadromous hatchery programs (USDC 1996). Carson National Fish Hatchery was constructed in 1938 to mitigate for the construction of Bonneville Dam and currently produces 1.2 million spring chinook smolts. A fish ladder at Shipherd Falls was constructed to allow salmon access to the hatchery at river mile 18. Hatchery steelhead smolts were released in the basin from the 1960's until 1998 when WDFW stopped stocking due to the risk of hybridization.

Timber harvest, road building, and other land use activities within the Wind River watershed have reduced the quality and quantity of salmonid habitat in the subbasin. In 1992, the American Fisheries Society rated summer and winter steelhead at a moderate and high risk of extinction respectively, and they listed the Wind River sea-run cutthroat trout as extinct (Nehlsen, *et al.* 1991). In 1997 Washington Department of Fish & Wildlife (WDFW) rated the Wind River summer run steelhead as critical. Wind River steelhead were listed as Threatened under the Endangered Species Act (ESA) on May 18th, 1998. Due to the status of this stock, the Wind River summer steelhead has the highest priority for restoration in the State of Washington's Lower Columbia Steelhead Conservation Initiative.

Most populations of salmonids that historically occupied the Wind River watershed are considered depressed (WDFW, *et al.* 1993). Because Shipherd Falls was a natural barrier to all anadromous fish except steelhead (Bryant 1949), summer steelhead were dominant and numerous above this barrier. USFWS (1951) estimated the summer steelhead run size was 3,250 with an escapement of 2,500 spawners. The current number of wild summer steelhead spawning in the Wind River subbasin was reduced to approximately 200 adults in late 1990's (Rawding 1997b). More recently, the 2003 and 2004 runs have rebounded to estimated runs of over 1,000 adults (Cochran 2003).

3.2.2.4. Steelhead found in Trout Creek

It is estimated that Trout Creek historically produced 350 to 700 adult steelhead or approximately 10 – 20% of total Wind River spawning (D. Rawding per. com. 2003) The annual adult return to Trout Creek over the period of monitoring has declined from a high of 450 adults (range: 162 – 464) in the 1980's to less than 30 and below 10 adults in the early 1990's (WDFW Redd Surveys and Adult Trap Data, 1980 – 2004). Adult steelhead enter the Wind River watershed every month of the year, with the bulk of the run entering in the late spring and summer months. Steelhead enter Trout Creek in two distinctive time periods; March – June and September – November (Figure 3-25).

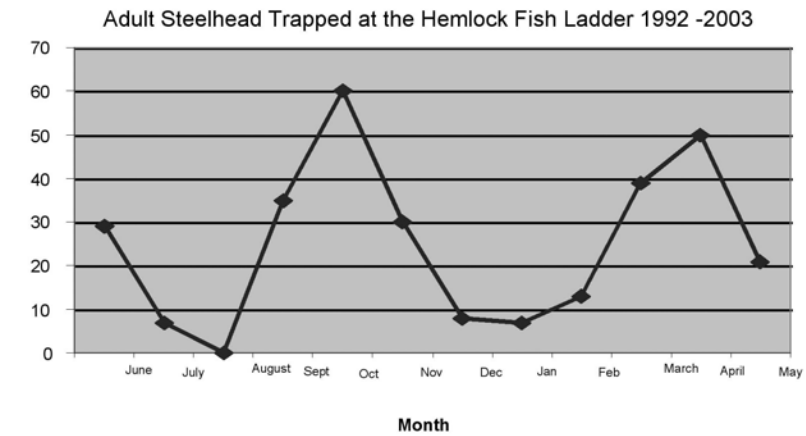

Figure 3-25. Numbers of adult steelhead trapped by month at the Hemlock dam fish ladder 1992 – 2003, Skamania County, Washington.

The run timing of steelhead into Trout Creek appears to be dictated by water volume and/or water temperature (Figure 3-26).

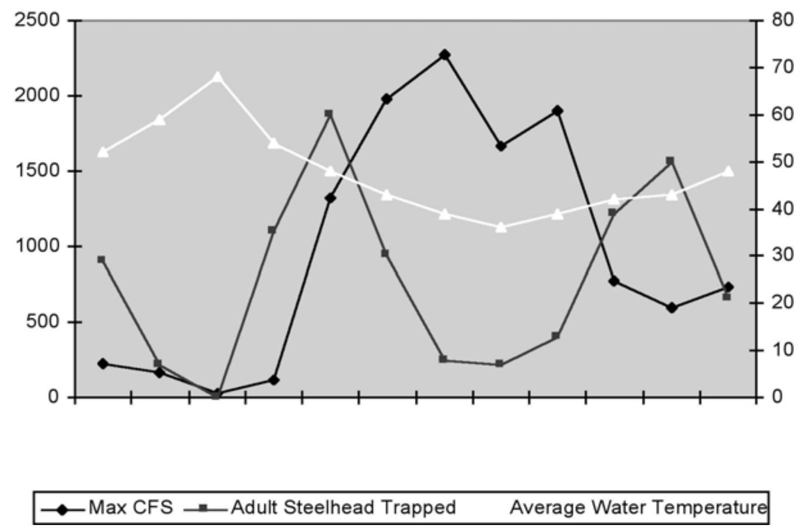

Figure 3-26. Number of adult steelhead trapped by month at the Hemlock dam fish vs. discharge in cubic feet per second (CFS) and average monthly water temperature in Fahrenheit 1992 – 2003, Skamania County, Washington.

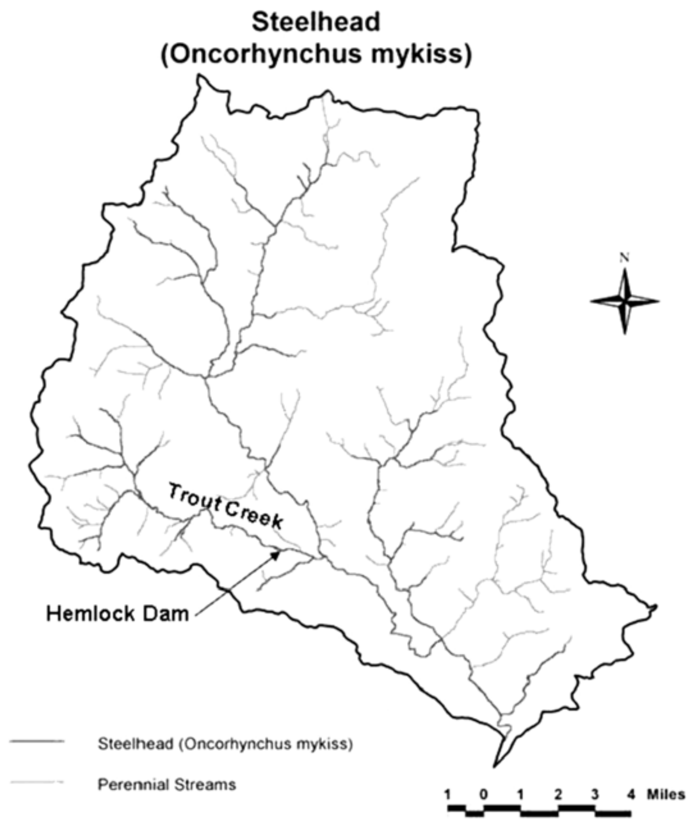

Figure 3-27. Steelhead distribution for the Wind River watershed in relation to Trout Creek and Hemlock Dam, Skamania County , Washington.

3.2.2.5. Upper Columbia River Steelhead

Snake River and Upper Columbia River steelhead stocks were listed as Threatened in August 18, 1997 and the Mid-Columbia River Steelhead were listed in March 25, 1999 by the National Marine Fisheries Service. Collectively, these ESUs include all naturally produced steelhead above the Wind River. Many yearling steelhead are known to overwinter in mainstem reservoirs, including tributaries of the Bonneville pool, and pass seaward in early spring. Juvenile steelhead show competitive dominance over juvenile chinook salmon in microhabitats shared by both species (Li, *et al.* 1987 in USACE 1995).

3.2.2.6. Chinook Salmon

(Oncorhynchus tshawytscha) Status in accordance with the ESA: Threatened, Lower Columbia ESU, 3/99, critical habitat.

Natural spawning of spring chinook in the upper Wind River did not occur until passage facilities were built at Shipherd Falls in 1956. After passage was provided, a spring chinook run was established at the Carson National Fish Hatchery (CNFH) and natural spawning began in habitats above and below the hatchery. Most juvenile chinook have been found in the main-stem Wind River above the hatchery but occasionally in tributaries including Compass, Crater, Planting, Trout, and Trapper creeks. In two years of smolt trapping below one of the primary spawning areas (above the CNFH) only four unclipped chinook smolts have been observed, which equates to approximately 16 naturally produced smolts. WDFW believes the majority of naturally spawning fish are hatchery strays, and that this population is not self-sustaining. Currently, spring chinook salmon in the Wind River are managed for hatchery production.

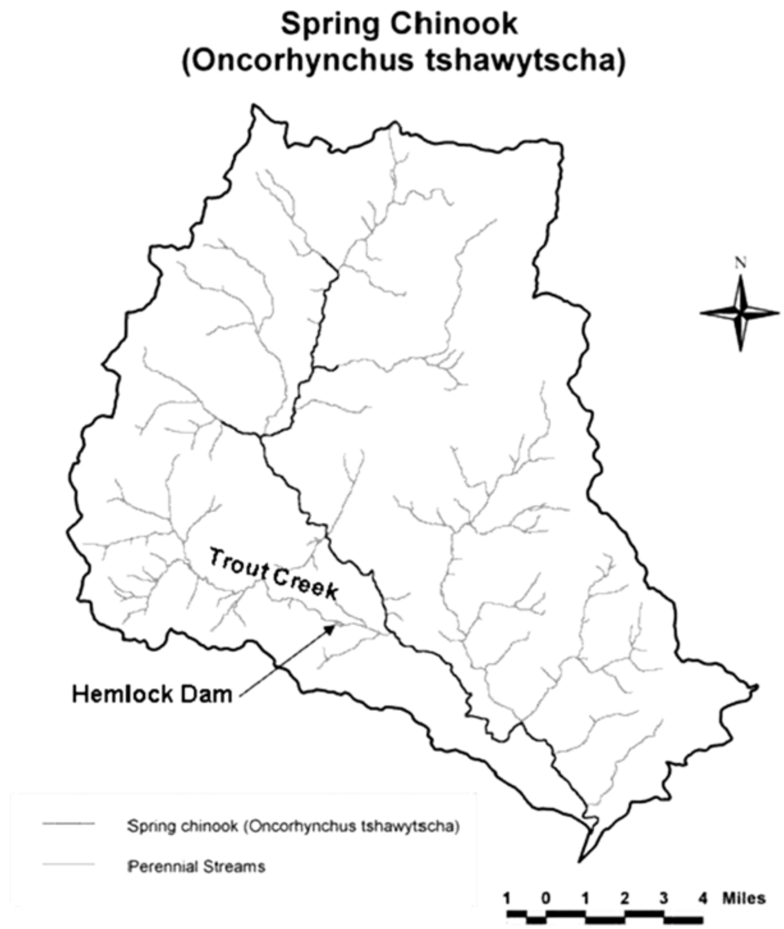

Figure 3-28. Hatchery Spring chinook salmon distribution for the Wind River watershed in relation to Trout Creek and Hemlock Dam, Skamania County , Washington.

Natural spawning of tule fall chinook in the Wind River occurs in the main-stem below Shipherd Falls. Spawning also may occur in the Little Wind River, but surveys have not been completed for this tributary. Completion of Bonneville Dam inundated the primary habitat in the lower Wind River. Natural production is likely composed of naturally produced adults and hatchery strays. Naturally produced fry are observed each year in the lower Wind River smolt trap indicating that fall chinook are successfully spawning. Tule fall chinook in the Columbia Basin has primarily been managed for hatchery production. Bight fall chinook salmon originated from the Columbia River above McNary Dam. These fish have been reared at Bonneville and Little White Salmon hatcheries to mitigate for chinook salmon lost due to the construction and operation of mainstem Columbia River dams. Stray brights from these facilities have been observed in the Wind River and natural production of bright fall chinook occurs in the Wind River. Bright fall chinook salmon tend to spawn later than tule fall chinook and the abundance of bright fall chinook salmon has been enumerated since 1988 in the lower Wind River.

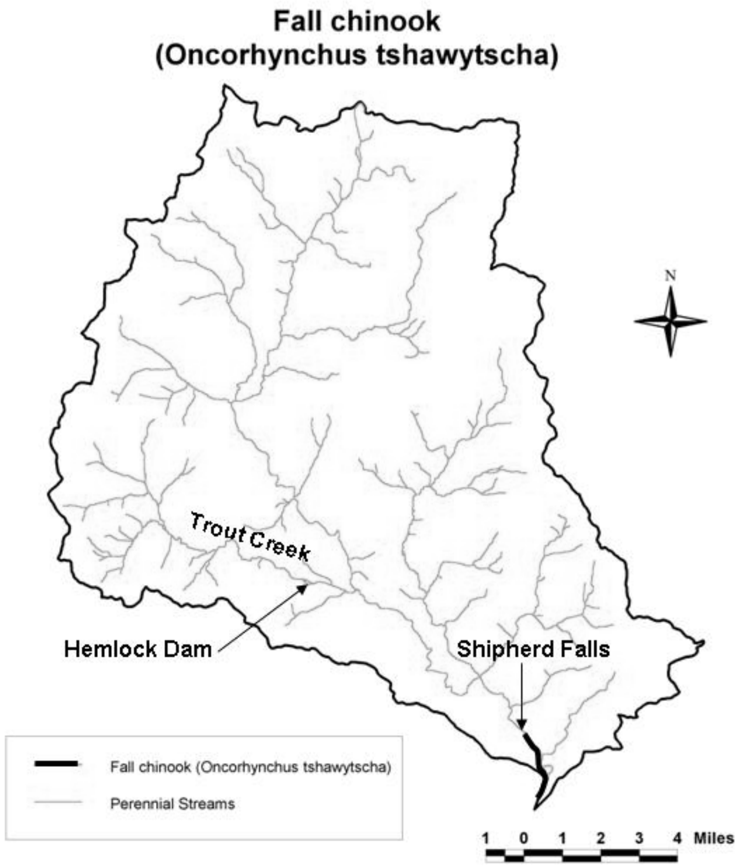

Figure 3-29. LCR Fall chinook salmon distribution for the Wind River watershed in relation to Trout Creek and Hemlock Dam, Skamania County , Washington.

3.2.2.7. Upper Columbia River Chinook Salmon

The spring and summer runs of Snake River chinook were listed as Threatened on June 3, 1992 and the Upper Columbia River spring chinook were listed on March 24, 1999 by the National Marine Fisheries Service. Snake River adult summer chinook salmon begin entering the Columbia River in late May, June, and July, pass Bonneville Dam during June and July.

The fall run of Snake River chinook was listed as Threatened on April 22, 1992 by the National Marine Fisheries Service. Snake River adult fall chinook salmon enter the Columbia River in July, and pass upstream over mainstem dams until the end of November. Most of the fall run consisting of "upriver brights" migrates from mid-August to November (USACE 1995).

3.2.2.8. Coho Salmon

(Oncorhynchus kisutch) Status in accordance with ESA: Threatened Lower Columbia ESU, 6/05.

The primary spawning grounds for coho were inundated by the Bonneville dam pool in 1938 yet a small spawning population of coho persists in the Wind River. WDFW believes that upstream adult coho distribution was limited to the area below Shipherd Falls. Although hatchery coho are not released in the basin, a few hatchery coho were observed at the Shipherd Falls adult trap in the fall of 1999 during the first year of adult trapping. Smolt trapping in the lower Wind River during the last five years has produced few wild coho smolts. This indicates that current natural production for coho is low and hatchery strays are a likely a source of any natural production.

3.2.2.9. Chum Salmon

(Oncorhynchus keta) Status in accordance with ESA: Threatened, Lower Columbia ESU, 3/99

The status of chum salmon within the Wind River is unknown. Historically, chum salmon were abundant in the lower reaches of the Columbia River, but currently are primarily limited to the tributaries downstream of Bonneville Dam. Known natural chum salmon production (less than a thousand annually) occurs in Grays River (Gorley Creek), Hamilton Creek (including Hamilton Springs), and Hardy Creek. Annually, a small number of chum are counted passing Bonneville Dam as well; nothing is known about the behavior of these fish.

3.2.2.10. Sockeye Salmon

(Oncorhynchus nerka) Status in accordance with ESA: Endangered, *Snake River ESU, 12/91)*

Adult sockeye salmon begin entering the Columbia River in April and continue to move upstream through October. Most of the run migrates upriver from June through early August with the majority of adult sockeye passing Bonneville Dam in the summer with the peak typically occurring July 1. Salmon River sockeye smolts will either be barged or are migrating down stream of the Wind River in the spring (April – June; U.S.A.C.E 1995).

3.2.2.11. Bull Trout

(Salvelinus confluentus) Status in accordance with ESA: Threatened, 1998

Little is known about the status of bull trout in the Wind River. Bull trout have been observed in the lower river below Shipherd Falls and managers believe that it is likely that these fish are part of an adfluvial population, which uses the Bonneville Pool. WDFW initiated a bull trout sampling project in the Columbia Gorge Province to more accurately determine the distribution of bull trout in the Wind River and other Washington tributaries. The objective of the project was to determine distribution, assess population status, and develop a recovery plan for these fish. No bull trout were observed within the Wind River watershed above or below Shiperd Falls.

3.2.3. Other Aquatic Species

3.2.3.1. Coastal cutthroat trout

(Oncorhynchus clarki clarki) Not federally listed.

Coastal cutthroat trout occur in the watershed, but the historic and recent distribution and status of this species are unknown. Historical distribution may have been limited to below Shipherd Falls, with the Little Wind River likely providing suitable habitat. Reports of cutthroat trout occurring above Shipherd Falls do exist, but they appear to be after hatchery cutthroat had been released into the watershed above Shipherd Falls. Hatchery cutthroat releases occurred at least as early as the 1930's, but were discontinued at least three decades ago. Personnel from USGS, Columbia River Research Laboratory have not observed any cutthroat trout during their extensive recent (1996 – 1999) surveys in first and second order tributaries accessible to anadromous fish throughout the watershed above Shipherd Falls. WDFW personnel have observed three coastal cutthroat in five years of smolt out migration monitoring at the lower Wind River trap located below Shipherd Falls. Because of the limited information and the lack of sampling that specifically targeted cutthroat trout, the status of coastal cutthroat trout in the watershed is unknown, but if present, the population number appears to be very low, the distribution appears to be very limited, and the sea-run form may be extirpated.

3.2.3.2. Pacific lamprey

(Entosphenus tridentatus) Not federally listed

Pacific lamprey utilize the lower Wind River below Shipperd Falls however very little information exists concerning their population status.

3.2.4. Endangered Species Consultation

The USFS is directed to review all planned activities for possible effects on species that are listed as Threatened, Endangered, Proposed or a Candidate for listing under the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531, *et seq*.), or their designated critical habitat that occur or are likely to occur within the analysis area. Lower Columbia River steelhead are the only listed species which exist in the immediate project area. Lower Columbia River chinook and coho salmon exist below Shipherd Falls and occupy approximately the lower three river miles of the Wind River. Snake River, Upper Columbia River, and Middle Columbia River steelhead, and Snake River (spring, summer, and fall) and Upper Columbia River (spring) chinook salmon may occupy the mouth of the Wind River or the right bank side of the Columbia River at (RM 154 – 152) during their migrations; all of these species may seasonally exist within the action area. Historically, chum salmon and bull trout may have occupied this lower reach of the Wind River, but they have not been documented in recent history. The introduced spring chinook salmon produced at the Carson National Fish Hatchery are not a listed species.

The Biological Assessment (BA) is the means of conducting a review of proposed projects effects to listed species and their critical habitat and of documenting the findings. Federally listed fish species or their critical habitat that occur or are likely to occur within the Hemlock Dam analysis area are fully reviewed in the BA that is a part of the record for this EIS. The review is summarized below and in Chapter 4.

3.2.5. Critical Habitat

Critical habitat has been designated as of September 2005 in Trout Creek and Wind River for LCR chinook salmon and steelhead, and includes the stream channel and banks up to the ordinary high water mark. Critical habitat represents the important physical and biological features essential for conservation of LCR chinook salmon and steelhead. Within the action area, critical habitat has three primary constituent elements: sites that have proper substrate, water quality and quantity to support spawning, incubation, and larval development; rearing sites that have sufficient water quantity, floodplain connectivity, food availability, and natural cover to support juvenile fish; and migration corridors that are free of obstruction and with sufficient cover, water quality and quantity to support juvenile and adult fish mobility and survival. Currently, the only other designated critical habitat exists within the Columbia River between RM 154 – 152 and only applies to SR sockeye and SR spring and fall races of chinook ESUs.

3.2.6. Essential Fish Habitat

The Sustainable Fisheries Act of 1996 (Public Law 104-267) amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to require Federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH). Essential Fish Habitat is defined in the Act as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Essential Fish Habitat includes all freshwater streams accessible to anadromous fish, marine waters, and intertidal habitats. Within the action area, this would include the Wind River from RM 10.8 to the mouth of the Wind River RM 0 and the Columbia River RM 154 – 152.

3.3. Recreation

An Overview

The public has used the Hemlock Lake area for recreation purposes since the Civilian Conservation Corps (CCC) constructed the facilities shortly after dam construction was completed in 1936. Referred to as “Trout Creek” at that time, the CCC created a picnic and camping area on the north side of the reservoir for public use; and a separate day-use site on the south side of the reservoir for exclusive use by USFS employees and the CCC members. Today, only facilities on the north side of the reservoir exist. The area is managed as a day-use site.

The 16-acre “lake” was, and continues to be, the big attraction to this site. It is also an important recreation resource for Skamania County, being the only shallow, warm water swimming opportunity in the County. Though the management emphasis and recreational uses have evolved over time, it is important to understand the long-standing connection that the community has had with the lake to understand the impacts that future management options may have on the users

3.3.1. Evolution of Facilities and Services

3.3.1.1. 1930 – 1940’s

The CCC constructed a picnic and camping area for public use on the north side of the lake at the existing day-use area that included a beach, a small boat launch area, a boat dock and swimming float (USDA 1986). A picnic and swimming area with a floating dock were maintained on the south side of the lake for exclusive use for the USFS employees and the CCC. The existing USFS historic files do not contain complete records or photographs of these areas that clearly depict all of the facilities that were present in the early years. A “Project Work Budget and Inventory” from 1946 does list the “recreation improvements” present at that time and most likely represents the facilities present from the 1930’s:

Table 3-10. Trout Creek 1946 Project Work Budget and Inventory

Item	Quantity
Road Surfaced	200 feet
Bulletin Board	1
Signs, small	2
Camp lots	5
Car Parking	10
Pipe	100 feet
Hydrants	1
Lakes, artificial	1
Toilets, pit	2
Garbage cans	1
Stoves, 1 party	5
Stoves, combination	5
Tables, family	10
Beach Improvement	1
Rafts	2
Dock	1
Bathhouse	1

From the list, one can deduce that there were five day-use picnic sites and five camping sites. The “stoves” most likely refer to rock fireplaces constructed by the CCC in the public area. During a 1994 USFS archaeological excavation within the site, a rock base of a stone fireplace was discovered.

3.3.1.2. 1950’s – 1960s

In an effort to provide additional recreational facilities for the Stabler community youth in the 1950’s, the Youth Benefit Society, the Skamania County Road Department, the local school district, and local residents combined efforts to make improvements to the day-use facilities at Hemlock Lake in the vicinity of the “frog pond” (Misner 2004). The reservoir was drained, sediment removed, and sand hauled in for a beach. Other improvements included new picnic tables, a changing house, flush toilets, a lifeguard tower, floating dock, diving board, sunning platform and a beach. An area was roped-off and designated as a controlled swimming area. The Youth Benefit Society and the local school district provided a lifeguard and conducted swimming lessons (Misner 2002).

In the 1960’s the area was closed to overnight camping.

3.3.1.3. 1980's

In 1981, the county-funded lifeguard service was discontinued due to the increase in reservoir sediment in the swimming area and the decline of available funds; the floating dock, diving board and lifeguard tower were removed at that time. In 1986, the bath house and diving board platform were removed from the shoreline (USDA 1986). The picnic area was extended and ten additional picnic sites were added; these were later removed.

3.3.1.4. 1990's to Present

The latest improvements to the picnic area were made in 1994 through a grant from the Interagency Committee for Outdoor Recreation (IAC) with an emphasis on providing barrier-free recreation opportunities. Two barrier-free viewing decks were constructed along the reservoir. A shoreline barrier-free trail was built along the entire length of the day-use area and the eroding sections of the shoreline were stabilized; new sand was added at the beach. The old toilet building was removed and new water lines and new flush toilet facilities were constructed; new barrier-free tables and table pads and fire stands were installed; a picnic shelter, with power, was constructed along with a barrier-free boat landing area and boat ramp.

3.3.2. Evolution of Use and Users

Initially, the residents of Stabler were the primary day-use visitors and residents from the communities of Carson and Stevenson were primary users of the camp sites. There were few non-local visitors. In the 1960's local businesses held potluck picnics at the lake on Sundays throughout the summer. In the early 1980's the County Parks Department used the area for summer youth outings and bussed the children to the area for a supervised outing twice a week during the summer. The Girl Scout camp at Wind Mountain used the lake for canoeing classes during the 1980's and 1990's (Linde 2004).

The State stocked the lake with trout each spring beginning in the 1950's for the June 1 opening day of fishing. This practice continued through mid-1994 when the area was closed to fishing because of impacts to the Threatened steelhead population in Trout Creek. In the late 1980's and early 1990's the USFS held its annual fishing derby at the lake (*ibid.)*

Today, the area continues to be a very popular day-use area for local residents (including Stevenson, Washington) as well as for an increasing number of non-local residents from the west end of Skamania County—Skamania, North Bonneville, Camas and Washougal and beyond. In addition, the area has experienced an increase in use from visitors camping at nearby USFS campgrounds who bring their families to Hemlock Lake to swim for the day; and on Sundays, campers will leave the campgrounds in the morning and spend the afternoon at the lake before heading home. High use by American Indians in July and August during huckleberry harvesting in the Mowich Butte area of the Mount Adams District has also been observed. Families will stop in route at Hemlock to get drinking water and to swim. Collectively, non-local visitors now comprise close to an estimated one half of the total users of the area (*id.)*

3.3.3. Evolution of the Lake

Three key inter-related factors influence the lake conditions for swimming and boating: the use of wooden flashboards adjusted seasonally to raise and lower the depth of the lake water, the amount and location of sediment deposition, and water temperature. The bottom-line is that the lake conditions are dynamic, changing from year to year, affecting the recreational experiences associated with the lake.

3.3.3.1. Flashboards

The flashboards are manually installed to raise the water level for recreation activities during the summer months. This is the one of two methods that the USFS has direct control over to regulate water levels. The second is the sluice gate at the bottom of the dam. Use of the flashboards increases the depth of the water by approximately four feet. The flashboards are typically installed in mid-June and remain in place until the end of September. Though there is water leakage through cracks between the boards, the water level typically remains near the top of the flashboards. The actual depth of the water depends on the depth and location of the sediment.

3.3.3.2. Sediment Deposition

The sediment deposits in the reservoir fluctuate from year-to-year depending on winter stream flows. Changes may occur annually, affecting the conditions for recreation, particularly the formation of “islands”, and localized water depth. The USFS lacks documentation on the extent to whether and how sediment may have affected the use and quality of the lake-related experiences during the first 20 years following dam construction. Photographs taken during that time do show changes in the size and location of the islands. Correspondence received through scoping for this EIS (Misner 2004) is the first indication that the quality of the swimming area had been affected as early as the 1950’s, when actions were taken to improve the area.

The 1986 *Hemlock Lake Sedimentation Analysis* (USDA 1986), noted that the high level of sediment in the reservoir was likely due to the extensive logging that occurred upstream in Trout Creek to salvage timber blown down during the 1962 Columbus Day storm. As an example of how the sediment affected the reservoir at that time, it cites an incidence in the fall of 1969 when the reservoir was inadvertently drained. A large amount of sediment was flushed out and down Trout Creek. By the following spring the desilted area had filled in.

The same report cites a 1977 study that was done to determine the depth of the sediment in the reservoir. The water was deepest at the bridge—about seven feet— but this area also had the deepest sediment deposit. The average depth of the sediment was estimated to be five feet in the six acres of reservoir surveyed. By 1986, it was estimated that the water depth at the bridge was about four to five feet and that the sediment depth had increased several feet since the 1977 study. In 2004, it was approximately six feet deep just east of the bridge.

The objective of the 1986 USDA report was to evaluate options for removing sediment from Hemlock Lake to enhance swimming opportunities. It concluded that benefits from sediment removal would be short term for the six options considered; that the cleared areas would fill in during peak stream flow; and that the probability was high that that would happen within the first year after removal. It recommended that only the “swimming area” (east of the picnic site) be cleared. This was not done. The swimming area is mostly used now by teens who jump off of the adjacent viewing platform.

In 2004, the reservoir area immediately adjacent to the picnic area was six feet in depth, an increase of approximately two feet from the previous year.

3.3.3.3. Water Temperature

The water temperature of the reservoir is affected, in part, by the depth of the water, which in summer is affected by the depth and location of the sediment. Comments from local citizens who swam in the lake in the 1940’s and 1950’s state that the water was “very cold”. Today, the lake is commonly noted for its shallow, warm water conditions. USFS records lack temperature data from the earlier years to compare to today's conditions to know what the real changes have been over time.

3.3.4. Hemlock Lake Picnic Area

Besides being the only shallow, warm water lake attractive for swimming, the Hemlock Lake Picnic Area is now the most developed site on the Mount Adams District. Only one other facility on the District —Beaver Campground—has flush toilets. The Hemlock Lake recreation site is also the only highly-developed site on the District that currently does not charge a daily use fee/vehicle (under the 2004 Federal Lands Recreation Enhancement Act, a Northwest Forest Pass is $30, a daily pass $5), even though it provides the greatest number of amenities and the day-to-day costs to manage the site are among the highest on the District. At the Hemlock site, the weekend use alone generally requires cleaning the toilets twice per day and three daily garbage runs; it is not uncommon to fill a dumpster each weekend. Minor law enforcement issues occur there almost daily. The estimated annual cost to maintain and operate the site, including law enforcement, is approximately $8,200.

3.3.4.1. Patterns of Site-Use

Use of the site typically begins in late spring when people from the local area picnic at the site—the water is typically too cold to swim in at that time of year. As the season progresses, one can expect to see heavy use of the area on any given warm summer day. The grassy area by the beach and picnic shelter draws families with children and extended family groups. This area experiences a very large turnover of users on most days; double to triple turnovers are not uncommon. The area upstream from the picnic area tends to draw drop-ins and short term users without children, though it does receive use by families when the lower area is crowded.

The large deck, originally built as a barrier-free fishing deck, is now a gathering spot used primarily by teens and young adults who like to jump off the deck into the lake. It is not uncommon for groups as large as 40 to congregate on the deck. Use tends to be highest in the late afternoon and evenings. This area is the primary spot where law enforcement issues arise; drug and alcohol use by minors are the biggest issues.

The users of these three distinct areas seldom mix into the other areas. Overall use is dependent on weather conditions. Typically, visitor use at the picnic area starts around 9 AM and is occupied until closing; use of the upper area begins around noon and is used until 6 PM; use of the large deck area starts around noon and is occupied until closing. Official closing is 10 PM but seldom enforced. The area overall experiences few law enforcement issues; dogs off-leash and minors-in-possession of alcohol are the two most common problems.

3.3.5. Sense of Place/Place Attachment

In recent times, land managers have begun to recognize the importance of identifying and acknowledging connections between forest visitors and specific places in the forests when making land management decisions. A plethora of research papers, particularly within the past 10 – 15 years, have focused on describing and analyzing these connections, utilizing terms and concepts such as "place attachment", "place bonding", and " sense of place", though there is no standardized formula or methodology. These concepts provide an appropriate way to articulate the impacts that dam removal and the alternatives, including the no action alternative, would have on different communities and groups. Explanations and applications of how social scientists and the research community define and apply these concepts are available in the project record.

It is very clear from letters and comments from the public in response to the proposal to remove Hemlock Dam that many members in the local community have a strong attachment to Hemlock Lake and do not want to see it change. To begin to understand the individual and community connections, scoping letters were assessed and categorized by the type of comment made and their mailing address. While not a statistical sample, it will give a flavor of the connections that commenters have in relationship to Hemlock Lake and form a frame of reference to assess the impacts that management actions may have.

In total, 45 letters, comment forms, e-mails and meeting notes were reviewed in response to project scoping to assess the importance that Hemlock Lake recreation plays in the lives of the commenters. If an individual or organization commented more than one time, their comments were only included once. One letter did not fit any of the five categories and was excluded from the tally.

The comments were grouped into five categories. Three of the categories reflect commenters who mentioned recreation by either expressing a long term connection to Hemlock Lake; an interest in Hemlock Lake as a special or important place for recreation, or acknowledging a loss of current recreation opportunities with dam removal and stating a need or opportunity for alternative experiences. A fourth category of commenters expressed strong support for dam removal and that fish should not be sacrificed for recreation. The fifth category expressed support for dam removal with no comment on recreation. Excerpts from some of the letters and comments are provided for each category.

Expressed a long term connection to Hemlock Lake

"The reservoir created by Hemlock Dam has provided a fine recreational resource for families of Skamania County for more than sixty years, and more recently, it has attracted folks from out of the area…The youth from the Stabler area still depend highly on Hemlock Lake for recreation" (Misner 2001).

"I have been a resident of Stabler for 27 years. My husband grew up there and was a lifeguard at Hemlock lake when he was a teenager. While my children were growing up we spent almost every summer day there. My children have wonderful memories of playing, swimming and canoeing with their friends…If man can go to the moon, the Forest Service can think of a way to save this lake for the use of generations to come" (Larson 2001).

"Hemlock Lake, before it became silted in, was a beautiful recreation area that our whole family enjoyed" (Gay, S. 2001).

Expressed interest in Hemlock Lake as a special or important place for recreation

"Hemlock Lake is the only local free swimming and picnic area with fresh water available to the public of Skamania County. It is the only accessible swimming and picnic area for handicaps like myself and the elderly. It is the only water that gets warm enough to swim in" (Sweeney 2001).

"I respect the desire to maintain the steelhead species but that is only one small piece of a much larger picture. Hemlock Lake and the wetlands present opportunities for recreation and natural life that are much needed. One of the reasons we bought and built here was Hemlock Lake, not the steelhead run. Our children and grandchildren profit from the recreational opportunity provided by Hemlock" (Wyffels, W. 2001).

"Hemlock Lake should be maintained. It is a unique recreational opportunity. Certainly a significant "cost" to the removal option is the loss of a valuable recreation resource. There simply is no other safe place for swimming. The Wind River and Trout Creek don't have such great swimming "holes" as this one" (Wyffels, T. 2001).

Acknowledged loss of current recreation opportunities with dam removal and the need for alternate opportunities

"…the Gifford Pinchot Task Force is aware that some communities are opposed to dam removal because the area behind the dam provides a recreational swimming location. We do not discount this important use of Forest Service lands. However, we believe that there are options for replacing this use" (Brown 2001).

"Since the lake has silted in so greatly, it is no longer the recreational site it was intended to be. Trails along a new/recreated streambed could provide fine alternative recreational opportunities" (Musche 2001).

"If the dam is removed, it seems only right that a permanent recreation pond should be built to take care of the people as the return of the wild river would take care of the fish" (Jacobs 2001).

Expressed strong support for dam removal and that fish should not be sacrificed for recreation

"I feel too much emphasis is put on recreation and not enough on the health of the damaged Trout Creek System" (Hildenbrand 2001).

"Please take this dam out. The watershed about near Layout Creek and Trout Hill have tremendous potential for fish. Hemlock Lake is silted in and not useful—Kayakers, fisherman, recreators, wildlife viewers should all support this action" (Hunter 2001).

"I say take it out! There are plenty of places to swim, boat, picnic, etc. It is a ridiculous issue to put above nature" (Rose 2001).

Expressed strong support for dam removal with no comment on recreation

"I encourage removal of the dam because any mitigation measures leaving the dam in place will simply defer the problem" (Ford 2001).

"Complete dam removal and upstream rehabilitation is the lowest-risk- highest-return restoration strategy. We feel this alternative is the most cost effective, biologically sound, and socially acceptable approach for the long term health and recovery of Trout Creek/Wind River steelhead" (Mantua/Wild Steelhead Coalition 2001).

"I fully support the Forest Service's efforts to take this dam out. The massive proliferation of dams throughout our waterway over the course of the past century have seriously impacted the ecological health of our streams and rivers" (Huber 2004).

The residents and businesses of Skamania County, particularly those in vicinity of the Stabler and Carson areas, are the ones that would most likely be affected by the future of Hemlock Dam with respect to changes in recreation opportunities.

3.3.6. Site Capacity and Visitor Use

The USFS has not obtained systematic visitor-use counts at the Hemlock Lake site over the years nor controlled public use when it appeared that use exceeded site capacity. The 1986 USFS report titled *Hemlock Lake Sedimentation Analysis* states that the picnic area had a "people-at-one time" capacity of 115 and the swimming area a capacity of 150. The estimated annual use at that time was 20,700 visits: 10,800 for picnicking and 9,900 visits for swimming. The report did not state what this information was based on or how it was collected

Based on the facilities present today at Hemlock Lake, with 11 picnic tables and 25 parking spaces, the "persons-at-one-time" calculation equates to 105 for the entire site.

Random visitor counts were taken throughout the late spring and summer of 2002 and early summer of 2004 to estimate visitor use. The timing of the counts and number of days that counts were made were purely opportunistic. While not based on a statistical sampling scheme, the counts do reflect the daily seasonal use-patterns of the area and substantiate observations made throughout the years by District employees who manage or are otherwise familiar with the site.

Table 3-12 reflects the 2002 and 2004 daily "persons at one time" summaries from actual visitor counts:

Table 3-12. Daily "Persons at one time" (PAOT) counts during peak summer months at Hemlock Lake, 2002 and 2004.

	May	June	July	August	Sept
2002					
Range	7 – 38	0 – 134	7 – 111	5 – 107	1 – 38
Average	16	51	38	75	9
#Times >105	0	2	1	1	0
2004					
Range	0 – 22	0 – 97	6 – 143	-	-
Average	8	33	53	-	-
#Times >105	0	0	3	-	-

The random tallies were also used to estimate the *total* use during the peak months of May – September. Figure 3-29 reflects the estimated average monthly person counts at Hemlock Lake Picnic Site from mid-May through mid-September during 2002. The tallies were taken an average of 18 days per month from mid-May through mid-September and expanded to determine an average daily visitor count for each month. The average daily counts were then tripled to reflect the use-turnover that occurs daily at the site. The turnover rate was an estimate, based on years of observations by the USFS site manager (Linde 2004). These counts were then expanded to reflect a monthly use count. Figure 3-30 shows that the use peaks in August during hottest part of the summer with over 7,000 visitors, and drops off considerably after Labor Day.

Total use for the four-month time period is approximately 16,500 visitors. While the number reflects that the use may be equal to or *less* than the annual estimate given in the 1986 report, the site manager's observation over the past 30 years indicates that use has increased since the 1980's, and that the 1980 figures were probably high.

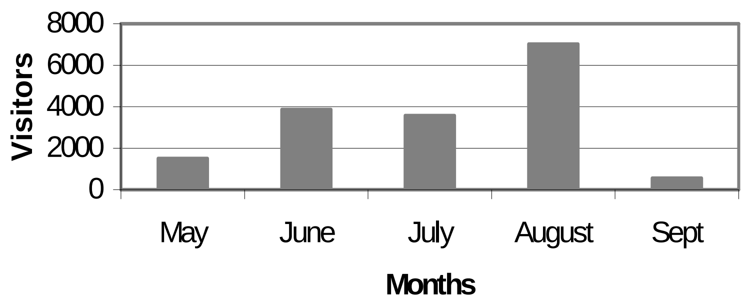

Figure 3-30. Estimated Average Monthly Visitor Counts at Hemlock Lake Day Use Picnic Area, 2002.

3.3.7. Projections of Future Development

No further development of water-oriented recreational sites is projected for the Gifford Pinchot National Forest. The nearest equivalent site would be development of Rock Creek cove near Stevenson; now in the early planning stages by Skamania County. Though farther away and in a more urban than forest setting, as envisioned, this site would provide a similar recreational experience.

3.4. Historic and Prehistoric Uses

In compliance with Section 106 of the National Historic Preservation Act, a heritage resource survey of the proposed project was completed in 2001. A number of heritage resources were identified within the project area. These include the Trout Creek Dam (also known as Hemlock Dam) and Fish Ladder, the Trout Creek Archaeological Site, and the Wind River Administrative Site Historic District.

The Trout Creek Dam and Fish Ladder were constructed between 1935 and 1936 by enrollees of Civilian Conservation Corps (CCC) Company 944, stationed at Camp Hemlock. These structures have been determined eligible to the National Register of Historic Places, based on their association with the Federal government's response to the Great Depression.

The Trout Creek site (45SA222) is a multi-component archaeological site which extends for approximately 400 meters along the north bank of Trout Creek at the Wind River Work Center administrative complex. It contains both prehistoric and historic components. The Wind River Lumber Company operated a logging camp at the site as early as 1903, and built the first dam across Trout Creek, a log splash dam. Timber was harvested in the area, and logs were skidded to the pond behind the splash dam. Historic components within the current project area include remains of their lumber camp, which was occupied between 1903 and 1910, along with remains of early USFS use (*ca.* 1906 to the present). A large Civilian Conservation Corps camp was located at the site between 1933 and the early 1940's. Hemlock Lake Picnic Area has been developed and utilized for recreational purposes since 1936.

The Wind River Administrative Site Historic District occupies the south bank of Trout Creek within the project area, and includes six pre-Depression-era structures, eighteen Depression-era structures, three historic landscapes, and the historic archaeological remains of numerous structures. The site has served as a Ranger District headquarters since 1906. The Wind River Nursery began operations at the site in 1909, developing previously logged-over areas as nursery fields. The Wind River Experiment Station and arboretum developed at the site beginning in 1912.

3.4.1. Prehistoric Use

The Trout Creek site most likely functioned as a seasonal base camp for people as they were traveling to upland locations to harvest available resources. Its location at a natural constriction along an anadromous stream indicates that the fish resource was likely an important one for the people who camped there. The site occupies an area of 16 acres. Historic components of the site were built on top of prehistoric components, and analysis of stratigraphy indicates considerable disturbance throughout the site.

3.4.2. Historic Period Use

Historic Euro-American use of the site began in 1898, when Bernard Erikson filed a homestead claim for 160 acres on the north bank of Trout Creek, a parcel which included the present site of the Wind River Work Center. It is likely that Mr. Erikson filed the claim with timber speculation in mind, since by 1901, prior to issuance of a patent, he sold the entire 160 acres to the Storey and Keeler Lumber Company. This company, which had incorporated in LaCrosse, Wisconsin in 1899, had been buying out settler's claims in the Wind River valley since May of 1900. Since Mr. Erikson himself was from LaCrosse, it is likely that he served as one of several "dummy" entryman sent from Wisconsin by the Storey and Keeler Lumber Company to claim timber land under the homestead laws.

In January of 1902 the Storey and Keeler Lumber Company changed its name to the Wind River Lumber Company. Through the purchase of homestead claims, they owned most non-federal land in the upper Wind River valley. Their subsidiary corporation, the Skamania Boom Company, had acquired a state charter in 1901 permitting the artificial flooding of the Wind River and its tributaries for the purpose of transporting logs (Tolfree 1984:4). The Wind River Lumber Company controlled the means of transporting timber, giving it a virtual monopoly on harvest of lands in the Wind River drainage.

Figure 3-31. Wind River Lumber Company's splash dam on Trout Creek, ca. 1910.

The only way to feasibly transport logs from the upper Wind River valley in the early 1900's was to float them down the river, and this was accomplished through the use of large splash dams. Splash dams were constructed on the Wind River, Trout Creek and Panther Creek between 1901 and 1903. The splash dam on Trout Creek was built within the project area, immediately upstream of the present concrete dam and bridge. These splash dams were substantial hewn log structures, featuring flood gates which were operated by a windlass. The logs were contained in ponds behind the dams and released as water rushed through the floodgates. Release of the water behind the dams was coordinated in order to provide sufficient volume of water to flush logs to the Columbia River, where they were then rafted to the Company's mill at Cascade Locks, Oregon.

Figure 3-32. Wind River Lumber Company employees on the south side of Trout Creek, across from Camp 3. Photograph *ca.* 1905, courtesy Penny Guest.

In 1903 the Wind River Lumber Company built logging Camp 3 at the site of the splash dam on Trout Creek. Company land in the vicinity of Camp 3 (the site of the present Wind River Work Center) was logged between 1903 and 1905. At least a portion of this area had burned in the Yacolt Fire of 1902.

At the time that Camp 3 was built, the land on the south side of Trout Creek in the vicinity of the project area was under the jurisdiction of the Mount Rainier Forest Reserve. The Ranger in charge at that time was Elias J. Wigal. In 1907 Wigal constructed a Ranger Station cabin on the south side of Trout Creek, near the Wind River Lumber Company's splash dam, directly across the creek from Camp 3. This would place it near the southern approach to the present concrete bridge. This one-room cabin, sided with cedar shakes, was the first ranger station constructed on the Mount Rainier Forest Reserve. The area was designated the Hemlock Ranger Station, due to the large number of hemlock trees in the vicinity. The site was chosen to enable Wigal to effectively administer the first federal timber sale sold to the Wind River Lumber Company in 1906.

The Wind River sale of May 10, 1906 (referred to as the May Timber Sale) was one of the first large commercial timber sales on Forest Reserve lands in the Pacific Northwest. It involved an area of 280 acres, from which 14.6 million board feet (MMBF) of timber was cut. This sale included the land on the south side of Trout Creek within the present project area. The total value of the timber sale was $12,921. This low value was attributed to the fact that the sale included a portion of the Yacolt burn of 1902, and the fire-killed timber had deteriorated to a marked degree. A second sale was sold to the company on November 21, 1906 (referred to as the November Timber Sale), estimated at 23 MMBF. This included a parcel at the far upstream end of the log pond on Trout Creek.

In the period between 1903 and 1912, Wind River Lumber Company's Camp 3 contained at least eleven buildings, including an office, three bunkhouses, a barn, blacksmith shop, filing shed and a cookhouse/dining hall. Early photographs provide information on the layout of the camp and the architecture of the buildings. The company office, barn, and two buildings identified from photographs as bunkhouses were of log construction with shake covered gable roofs. The cookhouse/dining hall was of frame construction with exterior walls of vertical boards and a gable roof covered with shakes. A third large bunkhouse was also of frame construction. The cookhouse and at least one of the bunkhouses were situated within the immediate project area.

Figure 3-33. Panoramic view of Camp 3 and the top of the splash dam, looking north. USFS photo taken 1909. Bunker Hill in background.

Camp 3 served as the base for both the May and November timber sales, and between the years of 1903 and 1910 served as home for crews of up to 50 men between the months of April through November. Due to their isolation, these logging camps were self-sufficient, and resembled small settlements. A number of sources were consulted for information on the people who occupied Camp 3, and the 1910 census provided a number of details. There were 34 people living at Camp 3 in April of 1910, occupying seven buildings. Occupations included logger (7), saw filer (1), hook tender (4), bucker (5), sniper (2), chaser (2), rigging rustler (1), donkey engine fireman (4), stationary engineer (1), donkey engine engineer (1), watchman (1), bookkeeper (1), blacksmith (1), teamster (1), cook (1) and waitress (1). The cook and waitress were the only women present. Fourteen of the residents were foreign-born. Two of the loggers spoke only Norwegian. Seven of those born in the United States were from Wisconsin. Only one man was from the local Carson area (he was also the only person from the state of Washington). Ages ranged from 18 to 47. These demographics emphasize the point that the majority of people working for large timber companies in Oregon and Washington at the turn of the century did not necessarily integrate into local communities. These companies, many of which were from the Midwest, often brought their workers with them, moving them from job to job.

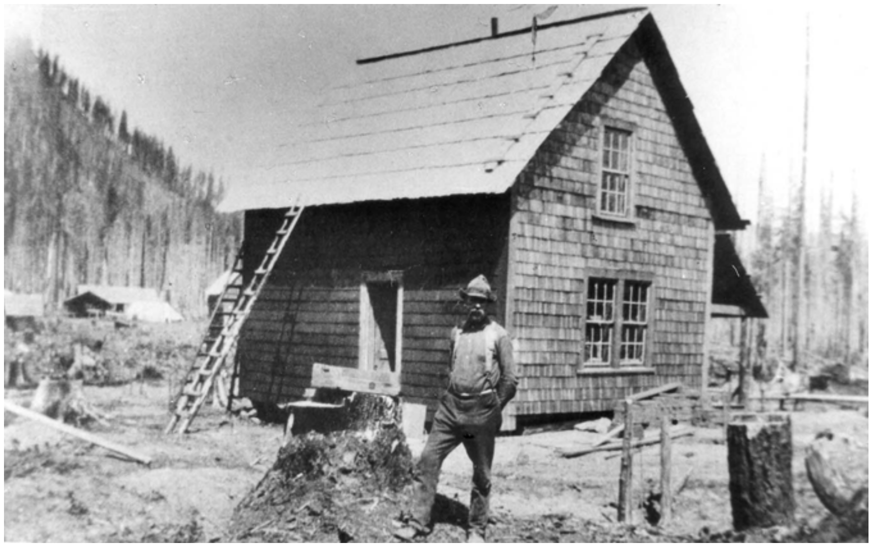

Figure 3-34. Hemlock Ranger Station, constructed on the south side of Trout Creek in 1909 by Ranger E. J. Wigal. Camp 3 visible in background.

Ranger Wigal constructed a second Ranger Station cabin at Hemlock between 1908 and 1909, next to the first one. It was two stories high and built entirely of hewn cedar logs. The sides were covered with split and shaved shingles. This building was situated along the edge of Trout Creek, at what is now the southern approach to the concrete bridge. The cabin built in 1907 was then being used as a tool house, and also as an extra bunkhouse for loggers working for the Wind River Lumber Company. Since the only access to Hemlock Ranger Station was across the Wind River Lumber Company's splash dam, Ranger Wigal constructed a log bridge across the top of the dam in 1910. These two cabins were the only USFS structures on the south side of the creek until 1911, and it is apparent from examination of ranger diaries and internal memos that the Wind River Lumber Company's barn, cookhouse, blacksmith shop, filing shed and root cellar at Camp 3 were being used jointly by the lumber company and the USFS.

The Wind River Lumber Company shifted its operation further north by June of 1910, and abandoned Camp 3. They continued to use their splash dam on Trout Creek to provide additional water to flush logs down the Wind River, however. Between the years of 1910 and 1912, the USFS used buildings at Camp 3, in particular the cookhouse and barn (where they kept their animals and stored their hay). They hired a cook in May of 1910, but this person cooked in the Wind River Lumber Company cookhouse. In 1912 they were still using the company's bunkhouses to accommodate shipping and transplanting crews at the newly established nursery. By 1913 the USFS finally constructed its own barn and messhouse on the south side of Trout Creek, and it is likely that Camp 3 was truly abandoned. By 1919 the majority of buildings at Camp 3 were gone. The only structure remaining on the north side of the creek in the 1920's was the log office building, which the USFS used as a bunkhouse (even though it was on Wind River Lumber Company land).

In 1923 the USFS converted the Wind River Lumber Company's splash dam to hydroelectric use, and a power house was built on the north side of Trout Creek, downstream from the splash dam. The power plant was built on what was then Wind River Lumber Company land. The USFS operated the hydroelectric plant and the dam under a long term lease with the Company. In 1924, all Ranger District buildings were wired for light from the Trout Creek hydroelectric plant.

The Wind River Lumber Company began to struggle financially in the 1920's, and a 1925 forest fire south of Falls Creek, probably started by sparks from one of the company's donkey engines, ultimately led to the company's bankruptcy. Mortgage foreclosure led to the sale of all company lands in 1926, and in 1929 the USFS purchased the parcel containing the former site of Camp 3 and the splash dam (the current Wind River Work Center). The desire to acquire the bridge and the hydroelectric plant were the primary catalysts for the purchase.

As a response to the economic hardships of the Great Depression, President Franklin D. Roosevelt created the Civilian Conservation Corps in 1933. Company 944, organized at Fort Lewis, Washington, arrived at Hemlock in May of 1933, and began construction of a 200-person CCC camp near the former site of Wind River Lumber Company's Camp 3. With the construction of Camp Hemlock, the stress on the power plant had increased to the point where it was clearly inadequate. A new power house was constructed on Trout Creek in 1934. Since the Wind River Lumber Company's splash dam was also in poor condition following a flood, the decision was made to replace it with a concrete dam.

The dam and fish ladder on Trout Creek was the single biggest construction project undertaken by the CCC at Camp Hemlock. Built between 1935 and 1936, the dam is a concrete arch dam 183 feet across, with a 112 foot-wide spillway. The height of the dam is 26 feet to the crest of the spillway, and 32 feet to the tops of the abutments. A total of 440 cubic yards of concrete was used in its construction. It is one of the few CCC-era dams still serving a functional existence in a relatively unmodified state (Horn 1983). Photos taken during dam construction show cement being hauled in wheelbarrows by CCC enrollees, as well as a three-yard cement mixer, purchased for the project, set in various locations on platforms with the cement being transported to forms by means of a chute.

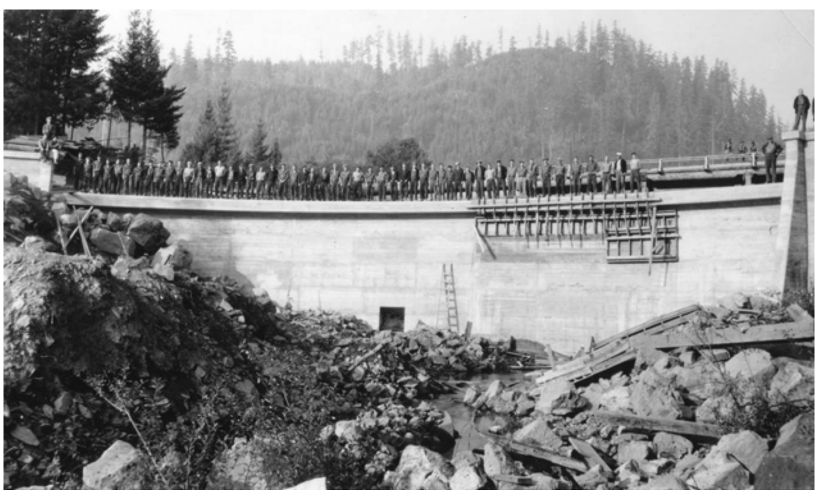

Figure 3-35. Trout Creek Dam upon completion in 1935, with members of CCC Company 944.

A weir and stall-type concrete fish ladder, 155 feet long, was completed in 1936 along the south bank of the creek. The dam and fish ladder embody the utilitarian design characteristic of CCC architecture, in that they were intended to blend with the surrounding landscape. The use of native bedrock as part of the wall of the fish ladder is an example of this design. After the dam and fish ladder were completed, the CCC constructed a three-hinged wooden arch bridge across the creek, to replace the Wind River Lumber Company's log bridge. This 1936 bridge was replaced by a concrete bridge built in approximately the same location in 1975.

Figure 3-36. View of fish ladder, looking west. USFS photograph, taken 1992.

Aside from generating electricity for the compound, the dam provided recreational opportunities in Hemlock Lake. In 1936 the CCC began development of a picnic area along the north shore of Hemlock Lake, which included a boat launch, boat dock, swimming float, and picnic and beach facilities.

In 1940 the D.C. generator at the power plant was replaced by an A.C. generator, capable of supplying electricity to the entire compound at Wind River. By the 1950's, however, Bonneville Power Administration began supplying electricity to the administrative site, and the power plant was shut down and eventually removed. A new intake and screening system for irrigation was completed on the dam in 1954, utilizing the outlet that formerly supplied the powerhouse with water. A pumphouse was installed below the dam in 1958, providing water to irrigate newly-developed nursery fields.

Historic components of the Trout Creek site were built on top of prehistoric deposits, resulting in considerable disturbance. During the period of splash dam logging in the area, large diameter logs were skidded across what is now the picnic area into the pond behind the splash dam. It is estimated that up to 15% of the area within the boundaries of the Trout Creek site was cleared and graded during construction of CCC Camp Hemlock in 1933. Construction of the Trout Creek Dam and bridge, and of the subsequent concrete bridge in 1935, undoubtedly disturbed portions of the site, in particular the remains of Wind River Lumber Company's cookhouse/dining hall, which was situated immediately above the present dam. USFS use of the site for nursery development and general administration began in the 1950's, and this included building construction, drainfield installation, installation of buried fuel tanks, field clearing and leveling, and cultivation. At a minimum, there are 2,600 linear meters of buried water, sewer, and phone lines in current use within the boundaries of the Trout Creek site. During the past ten years, three projects were undertaken within the site's boundaries which were determined to have an adverse effect on the site, including picnic area development in 1995, removal of modular buildings and walkway installation in 1995, and a legislated land conveyance, which included a portion of the Trout Creek site, in 1999.

The dam and fish ladder was modified in 1995, with the addition of a concrete wall extending out from the downstream end of the fish ladder, towards the face of the dam. The lowest weir of the fish ladder had its weir wall replaced with a wall and slot. A waterline was installed to transport water to the base of the fish ladder. This consisted of a 24" polyethylene pipe, originating at the concrete enclosure for the traveling screen. A 26" diameter hole was drilled in the enclosure wall downstream of the screen, and the waterline was attached to the upstream face of the dam. Another 26" diameter hole was drilled near the south end of the dam, and the waterline was taken through the dam at this point, where it can spill out over the end of the fish ladder. The traveling screen was also modified. These modifications were determined to have an effect on the dam and fish ladder that was not adverse.

3.5. Socio-Economic

3.5.1. Demographics of Skamania County

Skamania County encompasses 1,672 square miles within Southwest Washington, along the Columbia River (Figure 3-37). The majority of the County lies within federal land ownership, containing portions of the Gifford Pinchot National Forest, the Columbia River Gorge National Scenic Area, and the Mount St. Helens National Volcanic Monument. State Highway 14, along the Columbia River, is the major driving route; the metropolitan areas of Vancouver, Washington and Portland, Oregon can be reached in less than an hour's drive.

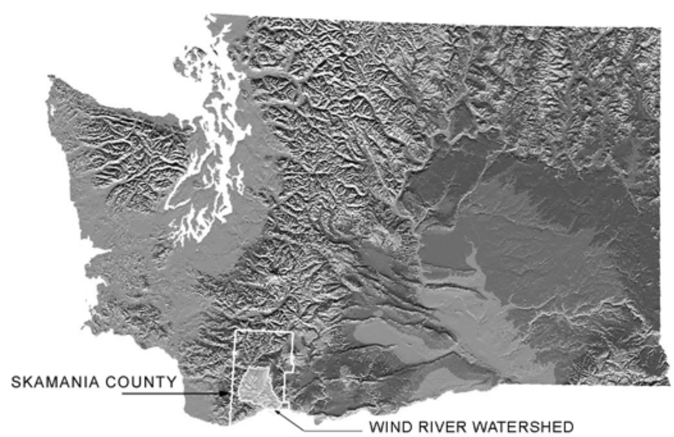

Figure 3-37. Skamania County, Washington.

For this analysis, 2000 Census data are used as a basis to describe racial and ethnic composition and poverty levels within Skamania County in order to evaluate the impacts of the alternatives on low income and minority groups (Environmental Justice, Executive Order 12898). The County demographics are described using U.S. Census Bureau data as well as 2000 Census data compiled by the Sonoran Institute; the Sonoran Institute, in conjunction with the Bureau of Land Management, used the Economic Profile System (EPSC) to compile census profiles.

Some data are available on a county-wide basis; other data are compiled on smaller geographic areas, referred to as a Census County Division (CCD). The CCD is a relatively permanent area established cooperatively by the Census Bureau and state and local governments. For Skamania County, the 2000 Census data was compiled for four CCDs: Wind River, Stevenson, Bonneville, and Gifford Pinchot (Figure 3-38). For this document, data from the Wind River and Stevenson CCDs are used.

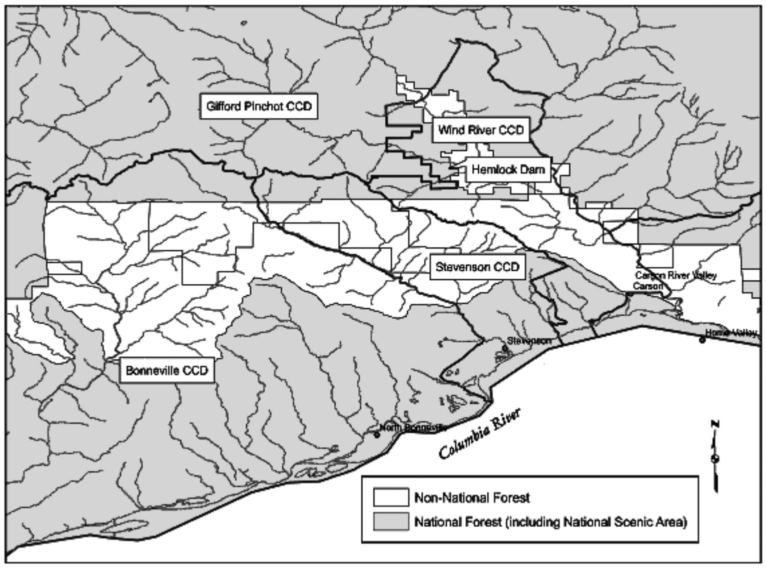

Figure 3-38. Wind River, Stevenson, Bonneville, and Gifford Pinchot Census County Divisions.

3.5.1.1. Population by Race

Total population of Skamania County in 2000 was 9,872. Table 3-13 shows the population of Skamania County in year 2000 by race. Ninety two percent of the population is White, followed by “Hispanic or Latino (4%); the remaining population is a diversity of other races. (Race and Ethnicity are broken out separately because Hispanics can be of any race.)

Table 3-13. Population of Skamania County by race in 2000.

Total Population of Skamania County by Race in 2000				
	County	% of Total	State	% of Total
White	9,093	92.1%	4,821,823	81.8%
Black or African American	30	0.3%	190,267	3.2%
American Indian & Alaska Native	217	2.2%	93,301	1.6%
Asian	53	0.5%	322,335	5.5%
Native Hawaiian & Other Pacific Islander	17	0.2%	23,953	0.4%
Some other race	240	2.4%	228,923	3.9%
Two or more races	222	2.2%	213,519	3.6%
Hispanic or Latino (of any race)	398	4.0%	441,509	7.5%
Not Hispanic or Latino	9,474	96.0%	5,452,612	92.5%

Table 3-14 identifies the total population of the Wind River subdivision by race. The largest number of residents is White (90.5%). The second largest group of residents is "Some other race" (3.3%), followed by American Indian and Alaska Native (2.9%).

Table 3-14. Total population of Wind River CCD by race in 2000

Total Population by Race		% of Total
White	4,087	90.5%
Black or African America	9	0.2%
American Indian & Alaska Native	133	2.9%
Asian	21	0.5%
Native Hawaiian & Other Pacific Islander	12	0.3%
Some other race	147	3.3%
Two or more races	106	2.3%

Table 3-15 shows the total population by race for the Stevenson subdivision. The largest number of residents are classified as White (91.8%). The second largest group is “Two or more races” (3.1%), followed by American Indian & Alaska Native (2.7%).

Table 3-15: Total population of Stevenson CCD by race

Total Population by Race		% of Total
White	1,641	91.8%
Black or African American	2	0.1%
American Indian & Alaska Native	49	2.7%
Asian	7	0.4%
Native Hawaiian & Other Pacific Islander	0	0.0%
Some other race	33	1.8%
Two or more races	56	3.1%

3.5.1.2. Poverty by Race

Persons and families are classified as “below poverty” if their total family income or unrelated individual incomes were less than the poverty threshold specific for the family size, age of householder, and number of related children under 18 present. Poverty thresholds are the same for all part of the country—they are not adjusted for regional, state or local variation in the cost of living (U.S. Census Bureau 2004).

The 2000 Census asked people about their previous year’s income. Skamania County as a whole had 1,281 individuals, or 13.1% of the county population, below poverty in 1999 (U.S. Census 2000). This is higher than the State of Washington, which as a whole had 10.6% of the population below poverty in 1999. Welfare payments, one expression of poverty, represented 9% of “transfer payments” made in 2000 within Skamania County, representing a total of 1.2% of total personal income (Sonoran Institute). For comparison, welfare payments represented eight percent of total transfer payments the State of Washington during 2000. (Transfer payments are characterized as payments by governments to individuals for which they have not “rendered current services”, i.e. retirement, disability, insurance, Medicare.)

The Sonoran data profiled the poverty levels by race for each CCD. The data are presented by percent of race below the poverty line. In both subdivisions, the “White” race had the highest total *number* of individuals below the poverty line, but other races had higher *percentages* below the line.

Fifteen percent of individuals within the Wind River CCD had income that was below the poverty line in 1999. Table 3-16 illustrates the numbers of individuals *by race* with income below the poverty level within the Wind River CCD. The race with the highest poverty rate is American Indian and Alaska Native (37%). The race with the lowest poverty rate is Black (0%).

Table 3-16. Poverty by race, Wind River CCD, 1999.

Poverty by Race (Individuals)		
	Number	**% of Total**
White	573	14%
Black	-	0%
American Indian And Alaska Native	57	37%
Asian	-	0%
Native Hawaiian & Other Pacific Islander	-	0%
Other Race	7	15%
2 or more races	20	21%
Hispanic Or Latino	56	24%
White not Hispanic	542	14%

Within the Stevenson CCD, the race with the highest poverty rate is Black (100%). The race with the lowest poverty rate is Asian (0%).

Table 3-17. Poverty by race, Stevenson CCD, 1999.

Poverty by Race (Individuals)		
	Number	**% of Total**
White	326	21%
Black	2	100%
American Indian And Alaska Native	22	28%
Asian	-	0%
Native Hawaiian & Other Pacific Islander	-	
Other Race	2	12%
2 or more races	7	11%
Hispanic Or Latino	2	7%
White not Hispanic	324	21%

3.5.2. Administrative Use of the Wind River Site

The recent history of the Wind River site is important to understand the cumulative economic effect to businesses in Stabler, Carson, and potentially Stevenson.

The USFS has had a strong presence in the Hemlock area beginning in the early 1900's, initially establishing a District office on Trout Creek in 1907 under the jurisdiction of the Mount Rainier Forest Reserve (refer to **3.4.2 Historic Period Use**, p. 44, *ff.*) This was followed by the establishment of the Wind River Nursery (1909), and Wind River Forest Experiment Station office (1912)—the first Forest Service research facility in the Pacific Northwest. The USFS Regional Office for Washington and Oregon commissioned the Civilian Conservation Corps in 1936 to construct the Hodgson-Lindberg Training Center and G.F. Allen Bunkhouse to train District Rangers throughout the Pacific Northwest. The area had the distinction of being known as the "Cradle of Forestry". Collectively, the area was designated the "Wind River Administrative Site Historic District" in 1999.

At its peak, the Wind River Nursery employed more than 300 people, the majority being temporary workers who worked for three to six months to plant, pull and pack the tree seedlings for distribution to national forests in Washington and Oregon. The Nursery was one of the largest employers in Skamania County. The co-located Wind River Ranger District employed over 60 full-time employees in addition to 50 or more summer temporary employees. The District was one of the largest Forest Service timber-producing Districts in the nation. Collectively, there were over 400 employees working out of the Hemlock office during spring and summer months at the peak of activity. The temporary jobs offered year-after-year employment that paid above minimum wage that many local citizens counted on for their livelihood. It was not uncommon for local families to have two generations of workers employed at the Nursery.

The Hemlock site, including the lake and recreation facilities, was a hub of the community for work and pleasure through the mid 1990s. The majority of the workers lived within the Wind River valley. Employees and their families occupied the nine houses on the compound year-round, and the bunkhouse was full to capacity during the field season. The Experiment Station lodged scientists at their office during the summer months.

The Wind River Nursery closed in 1996 due to Region-wide reductions in timber harvest, resulting in the first dramatic loss of jobs at the Hemlock site. Following the nursery closure, the majority of the nursery fields and associated buildings were conveyed to Skamania County. Since 2000 the County has been looking for a tenant to develop a business on the site that would create family-wage jobs to replace the 300 jobs lost through the Nursery closure (Durbin 2004 in the *Columbian* newspaper).

The subsequent Wind River-Mount Adams District consolidation implemented in 1999 – 2000 resulted in the Wind River District office designated as the Wind River Work Center, with the District headquarters office located in Trout Lake, Washington. Approximately 30 positions were affected by the consolidation, either eliminated or displaced to Trout Lake during 1999 – 2000. (Many positions were also eliminated at Trout Lake and at other offices on the Gifford Pinchot National Forest.) In 2003, public information services were curtailed at the Hemlock office and centralized in Trout Lake, further reducing the USFS presence at the Hemlock site.

3.6. Wildlife

3.6.1. Wildlife Habitat and Species

The National Forest Management Act (NFMA) (36 CFR 219.19) requires that the USFS manage fish and wildlife habitat to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population is regarded as one which has the estimated numbers and distribution of reproductive individuals to ensure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support at least a minimum number of reproductive individuals, and that habitat must be well distributed so those individuals can interact with others in the planning area.

Habitat surrounding the Hemlock Lake includes residential buildings and yards, old nursery fields currently covered with herbaceous plant species, deciduous riparian stands adjacent to the reservoir and Trout Creek, second-growth conifer stands that are approximately 90 years old, and old-growth conifer stands that are about 300 years old. There are over 260 fish and wildlife species that are federally listed or state listed as Threatened, Endangered, or Sensitive, or species of concern in Washington. Table 3-18 lists species that are known to occur or have potential to occur within or adjacent to the project area. Federally listed species that are not included in Table 3-18 are not present in the project area based on unsuitable habitat or the project area is clearly outside the recognized range of the species.

Table 3-18. Threatened, Endangered, Proposed, and Sensitive species that have potential to occur within or adjacent to the project area.

Species Name	Species Status	Habitat Present	Species Present
Mammals			
Gray Wolf *Canis lupus*	T	No	No
Grizzly Bear *Ursus arctos*	T	No	No
Canada Lynx *Lynx canadensis*	T	No	No
Pacific Fisher *Martes pennanti pacifica*	C	No	No
California Wolverine *Gulo gulo*	S	No	No
Western Gray Squirrel *Sciurius griseus*	S	No	No
Townsend's Big-eared Bat *Corynorhinus townsendii*	S	Potential	No

Species Name	Species Status	Habitat Present	Species Present
Birds			
Bald Eagle *Haliaeetus leucocephalus*	T	Yes	No
Northern Spotted Owl *Strix occidentalis caurina*	T	Yes	Yes
Critical Habitat for the Northern Spotted Owl	D	Yes	Yes
Great Gray Owl *Strix nebulosa*	S *	No	No
Marbled Murrelet *Brachyramphus marmoratus*	T	No	No
Critical Habitat for the Marbled Murrelet	D	No	No
Common Loon *Gavia immer*	S	No	No

Species Name	Species Status	Habitat Present	Species Present
Birds			
Ferruginous Hawk *Buteo regalis*	S	No	No
American Peregrine Falcon *Falco peregrinus anatum*	S	No	No
Green-tailed Towhee *Pipilo chlorurus*	S	No	No
Reptiles			
Northwestern Pond Turtle *Clemmys marmorata marmorata*	S	No	No
Striped Whipsnake *Masticophis taeniatus*	S	No	No
California Mountain Kingsnake *Lampropeltis zonata*	S	No	No
Amphibians			
Oregon Spotted Frog *Rana pretiosa*	C	No	No
Larch Mountain Salamander *Plethodon larselli*	S *	Potential	No
VanDyke's Salamander *Plethodon vandyke*i	S *	Potential	No
Cope's Giant Salamander *Dicampton copei*	S	No	No
Cascade Torrent Salamander *Rhyacotriton cascadae*	S	Potential	No

Species Name	Species Status	Habitat Present	Species Present
Butterflies			
Mardon Skipper *Polites mardon*	C	No	No
Mollusks			
Puget Oregonian *Cryptomastix devia*	S *	Potential	No
Burrington's Jumping Slug *Hemphillia burringtoni*	S *	Potential	No
Warty Jumping Slug *Hemphillia glandulosa*	S *	Potential	No
Malone's Jumping Slug *Hemphillia malonei*	S *	Potential	No
Panther Jumping Slug *Hemphillia pantherina*	S *	Potential	No
Columbia Duskysnail *Lyogyrus n. sp. 1 (Amnicola sp. 4 - G2)*	S *	No	No
Blue-gray Taildropper *Prophysaon coeruleum*	S *	Potential	No
Dalles Sideband *Monadenia fidelis minor*	S *	Potential	No

Endangered Species Act (ESA) designation:
T = Threatened
C = Candidate for federal listing
D = Designated habitat
USFS designation:
S = Sensitive
S * = Sensitive, former Survey and Manage species

Habitat in the vicinity of Hemlock Lake is unsuitable for many federally listed species such as Canada lynx. If otherwise suitable, the amount of human use of the area, including residential and recreation use, makes the habitat unsuitable for many species that require relative solitude, such as gray wolf, grizzly bear, and wolverine. These species will not be analyzed further in this EIS.

3.6.2. Federally Listed Wildlife Species

The USFS is directed to review all planned activities for possible effects on species that are listed as Threatened, Endangered, Proposed or a Candidate for listing under the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531, *et seq*.), or their designated critical habitat that occur within the analysis area. The biological evaluation (BE) is the means of conducting the review and of documenting the findings. Federally listed wildlife species or their habitat that occur or are likely to occur within the Hemlock Dam analysis area are fully reviewed in the BE that is a part of the record for this project. The review is summarized below and in Chapter 4.

3.6.2.1. Bald Eagle

(Haliaeetus leucocephalus) Status in accordance with ESA: Threatened species; Washington State Threatened species.

The bald eagle is a resident along the Columbia River. Winter range includes parts of the lower and middle sections of the Wind River. Feeding areas and perches are located along streams and lakes. Bald eagles are seen feeding in the Wind River during the chinook salmon spawning season in August and September. No nests have been located within the Wind River watershed; however, winter communal roosts are highly suspected to occur along the ridges surrounding the Trapper Creek and Wind River confluence. Winter surveys were conducted in 1998 without successfully finding communal roosts. It is possible that bald eagles occasionally forage at the reservoir, and a bald eagle was seen in 1997 foraging on carrion in one of the nursery fields.

Actions that result in an increase in the steelhead population in the Wind River and Trout Creek would likely benefit bald eagles by increasing the available prey base.

3.6.2.2. Northern Spotted Owl

(Strix occidentalis caurina) Status in accordance with ESA: Threatened species; Washington State Endangered species; Gifford Pinchot Forest Plan management indicator species.

The northern spotted owl was listed as a Threatened species throughout its range in Washington, Oregon and northern California effective July 23, 1990 (USDI 1990a). Loss of late-successional forest habitat from timber harvest was the primary reason for the listing.

Spotted owl surveys have not been conducted for this project, but previous surveys in the area did not detect a nest site within 1.5 miles of the dam. Barred owls have been detected in recent years in the vicinity of the canopy crane (refer to Figure 2-3), and in mature stands near the reservoir. There is a stand of suitable nesting habitat approximately 150 yards southwest of the reservoir, and about 450 yards from the dam. This stand is about 66 acres in size. There is no other nesting habitat within one-half mile of the reservoir. The other conifer stands in the vicinity of the reservoir are mapped as either spotted owl foraging habitat or dispersal habitat. There is mapped foraging habitat adjacent to the west half of the reservoir.

Nesting habitat surrounds the old nursery field where the dredge spoils would be stored on three sides. However, only a very minor amount of the nesting habitat (less than 5 acres) is within 35 yards of the nursery field. This portion of nesting habitat is edge habitat that is not likely to contain a spotted owl nest. The closest known historic nest is about 0.7 mile north of the nursery field. Figure 3-39 shows the location of spotted owl nesting habitat in the project area.

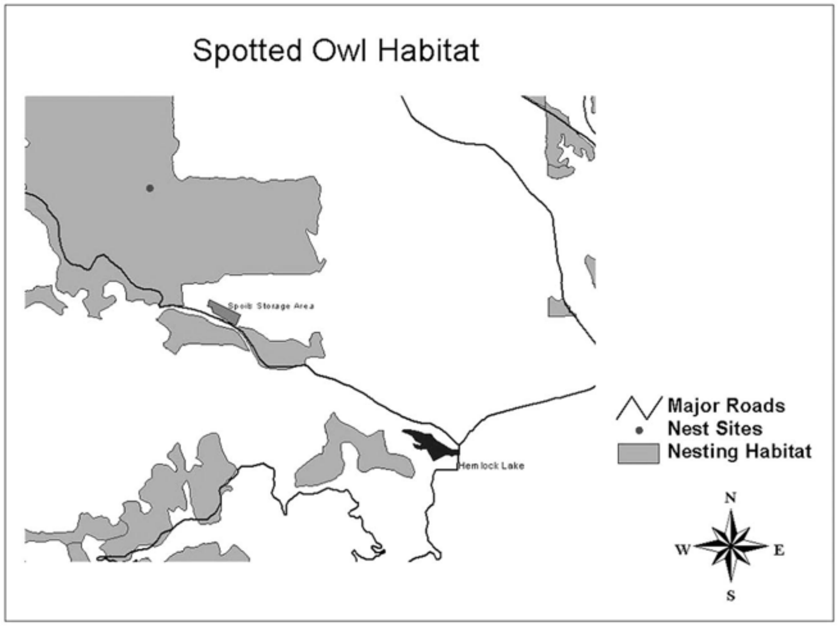

Figure 3-39. Northern spotted owl.

3.6.2.3. Northern Spotted Owl Critical Habitat Unit (CHU) WA-41

Critical Habitat Unit (CHU) WA-41 was designated with the expectation that the CHU would support at least 33 spotted owl pairs by providing essential nesting, roosting, foraging and dispersal habitat. The CHU was also designated to provide habitat connectivity between CHU WA-42 along the Yakama Nation lands to the east and CHU WA-40 and the Lewis River corridor to the west, and connectivity south to the Columbia River. Spotted owl surveys, completed in the 1980's to mid-1990's, located 31 spotted owl pairs and 12 single spotted owls within the CHU, and an additional 14 spotted owl activity centers within a 0.7-mile radius of the CHU boundary.

CHU WA-41 covers approximately 169,421 acres, all within the administrative boundary of the Gifford Pinchot National Forest. Due to a history of intensive timber harvest in the area prior to its designation as critical habitat, only about 52% of the CHU is currently suitable as spotted owl habitat. Analysis of the physiographic features within the CHU indicates that approximately 7% (12,127 acres) of the CHU is naturally unsuitable in the form of water, lava beds, etc. Currently, about 43% of the area within the CHU is early-seral forest that has the potential to develop into suitable spotted owl habitat over the next 50 to 150 years.

In the 1994 FSEIS baseline assessment, CHU WA-41 was estimated to contain approximately 88,099 acres of suitable spotted owl habitat, which represents about 18% of the spotted owl habitat on the GPNF. An additional 20,784 acres within the CHU provides dispersal habitat. Since 1994, the Fish and Wildlife Service has authorized the removal or downgrading of 1,042 acres of suitable spotted owl habitat in the CHU, thus the current baseline for the CHU is 87,057 acres of suitable habitat.

3.6.3. Region 6 Regional Forester's Sensitive Species

The Sensitive Species Program is the USFS's proactive approach to conserving species and preventing a trend toward listing under the ESA. The Sensitive Species Program provides for a diversity of plant and animal communities [16 USC § 1604(g)(3)(B)] as part of the USFS's multiple use mandate, and carries out the requirement to maintain viable populations under the National Forest Management Act (36 CFR 219.19). The Regional Forester's Sensitive Species List includes (1) federally proposed and listed species, (2) proposed and designated critical habitat; (3) federal Candidate species; and (4) Sensitive species for which population viability is a concern.

Review of the list of species formerly designated under the "Survey and Manage" mitigation measure of the Northwest Forest Plan (*Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (1994, amended 2001, 2004) concluded that some of these species met the criteria for inclusion on the Regional Forester's Sensitive Species list. In 2004 the survey and manage requirement was discontinued, however all species that were eligible for the Regional Forester's Sensitive Species List were added. All decisions signed after April 26, 2004 must include an evaluation of impacts of proposed management actions on all Region 6 Regional Forester's Sensitive species identified as documented or suspected to occur or that have habitat within the analysis area.

The following Sensitive species are known or suspected to occur or have habitat within the Hemlock Dam project area:

3.6.3.1. Cascade Torrent Salamander, Cope's Giant Salamander

The cascade torrent salamander is found in very cold, clear springs, seepages, headwater streams, or splash zones of waterfalls (Leonard, *et al.* 1993). It is a species that can be located in high numbers within appropriate habitat. Adults may also be found under debris on stream banks or in streamside forests and talus during rainy periods (Corkran and Thoms 1996). This species was found in Trout Creek above Hemlock Lake during surveys for other projects. It was not found in the vicinity of the reservoir.

Cope's giant salamander is almost always neotenic, and few metamorphosed adults have ever been documented. They live in small, steep-gradient, permanent streams with clear cold water. In suitable habitat, the streambed is composed of large gravel to small boulders with some large logs, and has no silt. As such, this species is likely to be found in the same streams as Van Dyke's and torrent salamanders, and it is not likely to be found in lake habitat. This species has not been documented on the Gifford Pinchot National Forest.

3.6.3.2. Townsend's Big-Eared Bat

This species feeds on moths and is an obligate to cave habitat resulting from open basalt tubes (Nagorsen and Brigham 1993). No known caves occur within the vicinity of the project. Bridges also serve as foraging sites and as protected roosts for big-eared bats to consume prey.

Studies of this species have shown that it forages preferentially along edges of streams and intermittent water courses, and in edge habitats of deciduous and mountain forests. Indications are that this species gleans moths and other insects off of vegetation while in flight. As such, it probably would not forage over the reservoir surface.

There are no known Townsend's big-eared bat populations in the vicinity of the reservoir. The bridge over the creek at the dam is not known to be a roost site.

3.6.3.3. Common Loon

The minimum habitat requirement for breeding pairs is thought to be one ten-acre lake. The lake must support a population of small fish that make up approximately 80% of the loon's diet. Loons prefer to nest on islands or the tips of promontories and along bays sheltered from waves.

Loons are easily disturbed during the nesting season and prefer to nest on lakes with little human activity. The small size of Hemlock Lake and the high amount of human activity during the summer months, both currently and historically, limit its suitability as nesting habitat for loons. In addition, the reservoir my not be long enough for loons to be able take off, or currently deep enough for them to escape predators.

3.6.3.4. Larch Mountain and Van Dyke's Salamanders

Van Dyke's salamander is considered to have a close association with variable forest conditions, montane lakes, twilight zones of caves, intermittent and perennial streams, river banks, and seeps. The Larch Mountain salamander also lives in variable forest conditions, areas dominated by rocky substrates, gravelly soils with large interstitial spaces, cave systems, and occasionally in or around seeps. Area searches were completed for both species in the area around Hemlock Lake.

Neither of these species was found in the project area, and the habitat is not typical of where these salamanders are found on the Forest.

3.6.3.5. Mollusks

Terrestrial mollusks currently on the Regional Forester's Sensitive species list for the Gifford Pinchot National Forest are: *Cryptomastix devia, Hemphillia burringtoni, H. glandulosa, H. malonei, H. pantherina, Monadenia fidelis minor,* and *Prophysaon coeruleum*. Surveys for terrestrial mollusks have been completed for this project. Special habitat features found in the proposed project area include leaf litter from deciduous trees and shrubs, needle litter, bark, down trees, and mosses. No Sensitive (formerly Survey and Manage) mollusk species were found during surveys.

One aquatic mollusk on the Regional Forester's Sensitive species list for the Forest (*Lyogyrus n.* sp. 1) is found in cold, well-aerated springs and outflows. As such, the area around Hemlock Lake would not be suitable habitat for this species.

3.6.4. Gifford Pinchot National Forest Management Indicator Species

Forests are also required to select and identify Management Indicator Species (MIS). These species are selected because their population changes are believed to indicate the effects of management activities. In the selection of MIS, the following categories are to be represented where appropriate:

- Endangered and Threatened plant and animal species identified for the planning area.
- Species with special habitat needs that may be influenced significantly by planned management programs.
- Species commonly hunted, fished or trapped.
- Non-game species of special interest.

Additional plant or animal species selected because their population changes are believed to indicate the effects of management activities on other species of selection, major biological communities, or on water quality.

3.6.4.1. Deer and Elk Biological Winter Range (BWR)

Biological winter range (BWR) was evaluated at the watershed, sub-watershed, and Forest-Allocated (Gifford Pinchot Forest Plan allocation “ES”) scales to determine optimal cover distribution and percent. BWR generally occurs at elevations <2,200 feet except when local knowledge includes other areas where herds are known to over winter

Thermal cover is lacking overall in both ES and BWR; it provides thermal protection and hiding cover for deer and elk. Open canopy cover (40 – 70%) is more common than closed (>70%). Extensive salvage logging (1980s) in this area created stands in 40-70% canopy cover which meet hiding cover conditions. Many stands are not fully functioning as thermal cover at this time.

Open forage conditions are not limiting within ES and BWR.

3.6.4.2. Wood Duck

In the Gifford Pinchot Forest Plan, wood duck represents species requiring mature and old-growth deciduous riparian habitat. Wood ducks have not been known to use Hemlock Lake, although they have been seen at the ponds near the canopy crane. They nest in the backwaters of rivers and streams and in woodland lakes.

3.6.4.3. Barrow’s Goldeneye Duck

In the Gifford Pinchot Forest Plan, Barrow’s goldeneye duck represents species requiring mature and old-growth coniferous riparian habitat. In western North America, the breeding range for goldeneye ducks extends along the mountain ranges from central Alaska to central California. It appears to reach its greatest abundance in British Columbia. In Washington, breeding Barrow’s goldeneye ducks have been reported at numerous locations east and west of the Cascade Mountains.

Barrow’s goldeneye returns to the same nest cavity year after year if it remains suitable. Potential nest sites include natural cavities in trees, nest boxes, holes in rock cliffs, and on the ground under a tree or thick brush. Nest sites are usually within 100 feet of water. Ponds smaller than 2 acres are usually too small to be occupied, but pairs have been known to nest at ponds as small as three acres. Home range size has been reported to be 40 to 60 yards of shoreline.

Barrow’s goldeneye eats both plant and animal food, including aquatic insects and insect larva, mollusks, crustaceans, fish, pondweeds, and algae.

Formal surveys have not been done on the District, however this species has been known to nest at Hemlock Lake, and a pair was observed in April 2004. The nest location is not known. This species has been reported to nest elsewhere on the Mount Adams District, including Forlorn Lakes and South Prairie. Other possible nest ponds are at Tyee Springs near the Carson Fish Hatchery, and the unnamed swamp near the canopy crane. Nest boxes have been installed at these sites, and mergansers have been known to use them.

3.6.4.4. Osprey

An unoccupied osprey nest exists near Trout Creek about 1.4 miles upstream from Hemlock Lake. This nest is across Trout Creek from the proposed dredge spoils storage site in the nursery field. Observers at the canopy crane report that the nest hasn't been used since at least 2001. When osprey were present on the nest they were commonly observed flying into the wetlands east of the canopy crane and into the Wind River (D. Shaw, pers. com.). It is possible that ospreys could forage at Hemlock Lake during times when large fish are present.

3.6.5. Neotropical Migratory Birds

A conservation strategy for land birds in coniferous forests in western Oregon and Washington was prepared in 1999 by Bob Altman of American Bird Conservancy for the Oregon-Washington Partners in Flight. The strategy is designed to achieve functioning ecosystems for land birds by addressing the habitat requirements of 20 "focal species". By managing for a group of species representative of important components of a functioning coniferous forest ecosystem, it is assumed that many other species and elements of biodiversity will be maintained.

Table 3-19 displays the focal species potentially positively or negatively affected changes in habitat, and the forest conditions and habitat attributes they represent.

Table 3-19. Focal species and the habitat attributes they represent.

Forest Conditions	Habitat Attribute	Focal Species
Old-growth	Large snags	Vaux's swift *
Old-growth/Mature	Large trees	Brown creeper *
Old-growth/Mature	Conifer cones	Red crossbill
Mature	Large snags	Pileated woodpecker
Mature	Mid-story tree layers	Varied thrush *
Mature/Young	Closed canopy	Hermit warbler
Mature/Young	Deciduous canopy trees	Pacific-slope flycatcher
Mature/Young	Open mid-story	Hammond's flycatcher
Mature/Young	Deciduous understory	Wilson's warbler
Mature/Young	Forest floor complexity	Winter wren
Young/Pole	Deciduous canopy trees	Black-throated gray warbler
Pole	Deciduous subcanopy/understory	Hutton's vireo
Early-seral	Residual canopy trees	Olive-sided flycatcher *
Early-seral	Snags	Western bluebird
Early-seral	Deciduous vegetation	Orange-crowned warbler
Early-seral	Nectar-producing plants	Rufous hummingbird *

* Significantly declining population trends in the Cascade Mountains physiographic areas.

Species present at Hemlock Lake and the nearby nursery fields include violet-green and rough-winged swallows, and Vaux's swifts that forage for insects over the lake's surface; white-crowned sparrows, savannah sparrows, spotted sandpipers, and common nighthawks. Of the species listed in the table above, those that are likely present include Vaux's swift, pileated woodpecker, winter wren, orange-crowned warbler, and rufous hummingbird.

In 1992 a compilation of existing information summarizing population trends of 101 species found on National Forests was prepared. On National Forests, populations of violet-green swallows, common nighthawk, savannah sparrow, white-crowned sparrow, Vaux's swift and orange-crowned warbler were found to be stable; rufous hummingbird populations were showing a decreasing tendency; and rough-winged swallows populations appeared to be declining.

3.6.6. Beaver

Effect of the proposed action to beavers was raised as an issue through scoping. Optimum beaver habitat is found on low gradient perennial streams or lakes with a relatively wide floodplain. There is a 40 – 60% tree canopy closure dominated by small diameter deciduous trees (1 – 6 inches), and a 40 – 60% shrub crown cover with shrubs six feet tall or taller. Stream with wide annual flow fluctuations are not suitable.

Beavers currently occupy Pass Creek, which is a tributary to Trout Creek in the Trout Creek flats area approximately six miles upstream from Hemlock Dam. Evidence of beavers has also recently been reported at Hemlock Lake. However, human use around the lake and scarcity of quality forage negatively affect the habitat quality. The portion of Trout Creek from Hemlock Lake upstream to Planting Creek is generally low quality beaver habitat due to the domination of large conifer trees in the overstory, and the relatively narrow valley. Trout Creek is also low quality habitat below Hemlock Dam for the same reasons, and because of the relatively steep gradient.

Hemlock Lake is the only site in Trout Creek that may be used by beavers from the mouth to Trout Creek flats (beginning at Planting Creek). In the absence of the dam the site may still be suitable for occupation by beavers if they could construct and maintain a dam. However, a beaver dam may not be able to withstand the high winter and spring flows in this part of Trout Creek.

Beavers are not uncommon on the Forest, and since the use of body gripping traps was outlawed in the state in December 2000 by Initiative 713, populations are likely to increase.

3.7. Botany

Much of the watershed lies within the western hemlock *(Tsuga heterophylla)* vegetation zone. This vegetation zone is characterized by a wet, mild, maritime climate, and forests dominated by Douglas-fir *(Pseudotsuga menziesii)* and western hemlock (Franklin and Dyrness 1973). Because the Columbia River is a primary east-west migration corridor for plants (and animals), this area has a high rate of plant endemism. The rare plant cold water Corydalis *(Corydalis aquae-gelidae*) is an example of a Pacific Northwest endemic species which is found at a number of sites within the Wind River watershed.

3.7.1. Species Associated with Wetlands

There are a number of small herb-dominated wetlands on the slope above the south lake shore. These wetlands are within the current riparian zone, and appear to be fed through a series of seeps located on the slope. These seep fed wetlands host a variety of species commonly associated with wetlands. Dominant vascular plants include skunk cabbage (*Lysichitum americanum*), giant cow parsnip *(Heracleum lanatum*), American speedwell *(Veronica americana*), hedge nettle *(Stachys cooleyae*), *Epilobium* sp. and small flowered waterleaf *(Nemophila parviflora*), as well as ground dwelling mosses and lichens including *Plagiomnium venustum*, *Eurychium oreganum* and *Peltigera membranacea*. Other plant species found within the riparian area include red alder (*Alnus rubra*) and bigleaf maple (*Acer macrophyllum*) in the overstory, with a diverse shrub understory including trailing honeysuckle *(Lonicera ciliosa*), twinberry *(Lonicera involucrata*), western ninebark *(Physocarpus capitatus*), cascara *(Rhamnus purshiana*), nootka rose (*Rosa nutkana*), *Rubus* spp., elderberry *(Sambucus racemosa*), snowberry *(Symphoricarpos albus*), willow *(Salix* sp.) and huckleberry *(Vaccinium* spp.).

At the bottom of the slope (where it meets the present lake shore) there is a linear stretch of graminoid dominated wetlands, that appear to be more dependent on proximity to the lake shore (and associated high water table), than on the slope seeps for their water source. These wetlands may, however, also be indirectly fed by the seeps above them on the slope. The invasive species reed canary grass *(Phalaris arundinacea*) was present in these lower wetlands.

3.7.2. Federally Listed Plant Species

There are no known current or historical sites of federally Threatened, Endangered or Proposed plant species within the proposed project area, however one federally Threatened species (*Howellia aquatilis*) is suspected. *Howellia aquatilis* has an extremely narrow habitat tolerance, generally confined to palustrine emergent wetlands with seasonal drawdown..

3.7.3. Sensitive Plant Species

Surveys performed within and immediately surrounding the project area located no Sensitive plant species. A number of Sensitive plant species were suspected within the project area based on suitable habitat. A complete listing and a review of the potential for impacts may be found in the Biological Evaluation that is a part of the project record.

3.7.4. Noxious Weeds

Of the three types of weed classifications in Washington State, Class A weeds require immediate eradication efforts; Class B weeds require active control; Class C weeds require monitoring, and project work, with the eventual goal of elimination.

Noxious weeds (shown with approximated occurrence level of low, medium, high) that are known to occur in the project area include:

3.7.4.1. Noxious Weeds in the Vicinity of Hemlock Dam and Reservoir

Class A Weeds

None

Class B Weeds

Cytisus scoparius (Scotch broom) – low

This species is growing in an open area on the south lake shore near where west footing of the coffer dam for the settling pond is proposed for installation.

Class C Weeds

Phalaris arundinacea (reed canary grass) – medium

This species is growing in clumps all along the south shore of Hemlock Lake.

Hedera helix (English Ivy) – low

This species is growing on the upper slope of the riparian zone on the South shore of Hemlock Lake, near one of the USFS residences (it looks like an escaped cultivar).

Hypericum perforatum (St. John's wort) – low

This species is growing scattered in the open areas on the edge of the south lake shore.

Circium arvense (Canada thistle) – low

This species is growing scattered in the open areas on the edge of the south lake shore.

Other undesirable invasive plants known to occur in the project area include:

Rubus laciniatus (cut-leaf blackberry) – low

This species is growing in an open area on the south lake shore near where west footing of the coffer dam for the settling pond is proposed for installation.

Taraxacum officianale (common dandelion) – low

This species is growing scattered in the open areas on the edge of the south lake shore.

Leucanthemum vulgare (oxeye daisy) – low

This species is growing scattered in the open areas on the edge of the south lake shore.

3.7.4.2. Noxious Weed Control at the Mouth of the Wind River

The current *Skamania County Integrated Aquatic Vegetation Management Plan* (Pfauth and Sytsma 2004) includes plans to treat aquatic weeds at the Mouth of the Wind River. Surveys conducted at the mouth of the Wind River in 2003 revealed aquatic weed infestations of Eurasian watermilfoil, coontail, common waterweed and *Nitella* species. Goals for treatment at this site (according to the Plan) focus on creating a deeper channel allowing unimpaired boater access between the county boat ramp and the Wind and Columbia River channels. Localized "high intensity" control in this area will achieve this goal without causing a need for treatment of the entire water body; recommended treatments include a combination of physical and chemical techniques. One of the physical techniques recommended includes dredging. According to the report, dredging will create a channel for boats and, in the process, remove significant biomass of aquatic weeds in this area. Re-growth of the weeds will be minimized if the channel is dredged to at least 15 feet in depth.

3.8. Past, Ongoing and Foreseeable Future Actions

The analysis of effects in this document includes cumulative effects of other actions (past, ongoing, and reasonably foreseeable future). These include a variety of past events and management activities, including the proposed action (or alternatives), restoration activities in

Trout Creek and Wind River, road construction and maintenance, timber harvest, agriculture, and recreation. The interdisciplinary team also considered conditions, such as the existence of Bonneville Dam on the Columbia River, which could contribute to effects from the proposed action or the alternatives on the aquatic resource.

The location is important in determining the extent of the effects for individual resources. The interdisciplinary team therefore considered the scale, in many cases. If the impacts of the proposed action could affect resources to the confluence of the Wind River with the Columbia River, such as sediment deposition, the scale of the analysis would include actions and conditions in the Trout Creek and Wind River watersheds. Past and ongoing actions and events are considered at the appropriate scale in the descriptions of the affected environment in this Chapter.

Table 3-20 lists past, ongoing, and foreseeable future actions within the project area that may add to or, in some cases, mitigate the effects of the proposed action or the alternatives. Relevant and applicable past, ongoing, and reasonably foreseeable activities on private, state, and other federal lands are also considered in the analysis of cumulative effects in Chapter 4.

Table 3-20. Examples of other past, ongoing and foreseeable future actions within the analysis area.

Past Projects/Activities	Type of Action	Location: Wind River (WR) Trout Creek (TC)
Wind River Nursery operations	Agricultural	TC
Change of use in Pacific Crest nursery fields	Land Use	TC
Conveyance/change in ownership and land use	Land Use	TC
Past FS timber sales	Logging	TC and WR
Private/State/County logging	Logging	TC and WR
Wind River Mine	Mining	WR
Columbia River Gorge National Scenic Area establ.	Recreation	WR
Picnic area development: boardwalk/viewing platforms	Recreation	TC
Archaeological excavation	Research	TC and WR
Forest road construction	Road Construction	TC and WR
Forest road maintenance	Road Maintenance	TC and WR
Noxious Weed abatement programs	Weed Control	TC and WR
Trout Creek and tributaries channel restoration	Channel Rehabilitation	TC
Trout Creek and tributaries riparian rehabilitation	Channel Rehabilitation	TC
Middle Wind Restoration	Channel Rehabilitation	WR
Mining Reach stream and riparian rehabilitation	Channel Rehabilitation	WR
Dry Creek stream and riparian rehabilitation	Channel Rehabilitation	WR
Forest road decommissioning	Upslope Rehabilitation	TC and WR
Landslide rehabilitation	Upslope Rehabilitation	TC and WR
Trout Creek culvert replacements	Fish Passage Improvement	TC
Trout Creek Fish Ladder auxilliary flow	Fish Passage Improvement	TC

Ongoing Projects/Activities	Type of Action	Location: Wind River (WR) Trout Creek (TC)
Change of use in Pacific Crest nursery fields	Land Use	TC
Dry Timber Sale (2005-2006)	Logging	WR
Private/State/County logging	Logging	TC
Wind River Mine	Mining	WR
Archaeological excavation	Research	TC and WR
Forest road maintenance	Road Maintenance	TC and WR
Noxious Weed abatement programs	Weed Control	TC and WR
Upper Trout Creek Restoration (2005-2006)	Channel and Riparian Rehabilitation	TC

Foreseeable Projects	Type of Action	Location: Wind River (WR) Trout Creek (TC)
Change of use in Pacific Crest nursery fields	Land Use	TC
Water rights changes near Hemlock Lake	Land Use	TC
Private/State logging	Logging	TC and WR
Timber harvest on adjacent Skamania County lands	Logging	TC
Tumble Timber Sale	Logging	WR
Win Thin Timber Sale	Logging	TC
Wind River Mine	Mining	WR
Archaeological excavation	Research	TC and WR
Wind River Highway Realignment	Road Construction	WR
Forest Road Construction	Road Construction	TC and WR
Forest Road maintenance, especially Forest Road 43	Road Maintenance	TC and WR
Milfoil abatement project by Skamania County	Weed Control	WR
Noxious Weed abatement programs	Weed Control	TC and WR
Mouse Creek culvert replacements	Fish Passage	WR